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2.5 INDEX SHEET

SLNO	Particular	Page no
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4	IA QP all department Samples	71-90
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Name of the Student : Chinag.M

USN : 1 R N 1 8 C S 0 3 5 Semster : 7th Section : A

Sub : Cryptography Sub Code :

Assignment	Max Marks	Marks Awarded	Initials of Staff with Date
Assignment - 1	10	10	4/5
Assignment - 2	10	10	28/5
Assignment - 3	10	10	30/6

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Name of the Student : Hemanth.D

USN : 1 R N 1 8 C S 0 4 6 Semester : 7 Section : A

Sub : Cryptography Sub Code :

Assignment	Max Marks	Marks Awarded	Initials of Staff with Date
Assignment-1	10	10	04/5
Assignment-2	10	10	21/5
Assignment-3	10	10	29/6
Average Assignment Marks	10	10	30/6

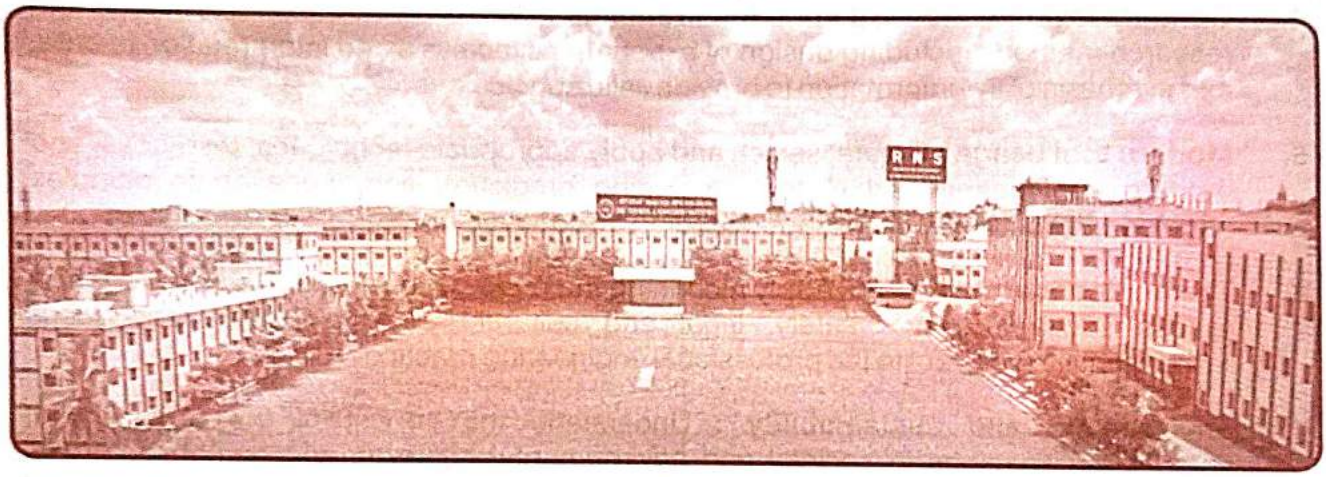
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ASSIGNMENT BOOKLET

Name : EKLOVEYA JAIN

USN : 1RN19CV009

Semester : V Sec : Civil

Subject : RC STRUCTURAL ELEMENTS

Sub Code : 18CV53

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Name of the Student : EKLOVEYA JAIN

USN : 1 R N 1 9 C V 0 0 9 Semester : V Section : Civil

Sub : RC STRUCTURAL ELEMENTS Sub Code : 18CV53

Assignment	Max Marks	Marks Awarded	Initials of Staff with Date
Assignment-1	30	30	DN 19/11/21
Assignment-2	30	30	DN 17/12/21
Assignment-3	30 + 30 =	60/60	
Average Assignment Marks		= 6/6	DN 28/1/22

28/1/22

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Name of the Student : Anil kumar RY

USN : 1 R N 2 0 E C 4 0 0 Semester : VI th ECE Section : 'A'

Sub : Digital communication Sub Code : 18EC61

Assignment	Max Marks	Marks Awarded	Initials of Staff with Date
Assignment-1	03	03	
Assignment-2	03	03	
Assignment-3	—	—	—
Average Assignment Marks	06	06	14/7/22

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Name of the Student : Neelesh kumar N

USN : 1 R N 1 9 E I 0 3 0

Semster : 6th Section :

Sub : Operating System Sub Code : 18EI643

Assignment	Max Marks	Marks Awarded	Initials of Staff with Date
Assignment - 1	10	10	19/7
Assignment - 2	10	10	19/7
Assignment - 3	10	10	19/7

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Name of the Student : Anagha

USN : 1 R N 1 8 I S 0 1 6 **Semester :** 7 **Section :** A

Sub : Cryptography. **Sub Code :** 18CS744.

Assignment	Max Marks	Marks Awarded	Initials of Staff with Date
Assignment-1	6	6	Principal 25/12/2021
Assignment-2	6	6	Principal 7/2/2022
Assignment-3	–	–	–
Average Assignment Marks	6	6	Principal 10/2/2022

S. No.	Date	Title	Page No.	Teacher's Sign

PAGE NO :
DATE : / /

Problems on Residential Status for Assignment

1.1 Determination of residential status of Mr. X for the A.Y 21-22.

Yrs	No of days Stayed in India
2020-21	1+30+31+30+31+31+28+31 = 213
2019-20	366-16 = 350
2018-19	365
2017-18	365
2016-17	365
2015-16	366
2014-15	365
2013-14	365
2012-13	365
2011-12	366
2010-11	365

B.C:-

∴ Mr. X stayed in India for a period of more than 182 days in P.Y. Hence he satisfied 1st B.C.

PAGE NO :
DATE : / /

1.10 Determination of residential status of X for the A.Y 2021-22.

Year	No of days stayed in India.
2020-21	30+31+30+31+31+30+15 = 188
2019-20	365
2018-19	15+31+30+31+31+30+31+30+31+28+35 = 350
2017-18	-
2016-17	-
2015-16	-
2014-15	-
2013-14	-
2012-13	-
2011-12	-
2010-11	-

B.C:-

1] X stayed in India for a period of 182 days in the P.Y. Hence he satisfied B.C.1.

2] X stayed in India for a period of more than 60 days & more than 365 days during 4 P.P.Y hence he satisfied B.C.2.

PAGE NO :
DATE : / /

A.C:-

1] X stayed in India more than 182 days or 2 years of 10 P.P.Y. Hence he satisfied A.C.1.

2] X not stayed in India for 730 days out of 7 P.P.Y hence not satisfied A.C.2.

Conclusion:-

X satisfied both B.C & A.C he is NOR for the A.Y 2021-22.

Sd/-
2021/22

Assignment 2

Gratuity

Problem 2.18

Date of retirement - 4/01/21
Service period - 16 yrs
B.S - ₹88000 p.m
D.A - ₹16000 P.m
Amount received - 1200000

Computation of Taxable gratuity of Mr. R for A.Y 21-22.

Particulars	₹	₹
Amount received		1200000
(-) least is exempted		
· Amount received	1200000	
· Max.	2000000	
· 15 day avg salary * S.P		
Sal = B.S + D.A		
60000 * 16	960000	
Taxable gratuity		240000

2.18 Computation of taxable leave salary for A.Y 21-22.

Particulars	₹	₹
Actual leave salary received		192000
(-) least is exempted :-		
Actual	192000	
Maximum	300000	
Last 10 Month salary	148000	
Avg of last 10 month salary	29600	29600
Taxable salary		162400

DOR ⇒ 31-10-20
1-10-20

1-10-20 to 31-3-20 = 12000 * 3 = 36000
1-4-20 to 31-10-20 = 16000 * 4 = 112000
148000

Avg = 148000 / 10 = 14800.

2.19 Date of retirement :- Sep 2020
Service period = 42 years
B.S = ₹50000 p/m
Amount received = ₹125000.

PAGE NO :
DATE : / /

2.43] Computation of gross salary of Mr. X for A.Y 21-22.

Particulars	₹	₹
B.S (6×12)		72000
Commission (300000×12%)		6000
HRA		
Actual HRA (700×12)	8400	
Rent Paid - 10% Salary		
(1000×12) - (10% of (72000+6000))	4200	
12000 - 7800		
40% of salary (78000)	31200	4200
Gross Salary.		82200

2.45] Computation of taxable of HRA of Mr. T for A.Y 21-22

Particulars	₹	₹
Actual HRA received		11700
(-) least of following exempted		
Actual	11700	
Rent Paid	4620	
13200 - (78000+7800) ×10%		
13200 - 8580		
40% of 85800	34320	4620
Taxable HRA		7080

PAGE NO :
DATE : / /

2.46] Computation of Taxable HRA for the A.Y 21-22.

Particulars	₹	₹
Actual HRA received (800×12)		9600
(-) least is exempted		
1) Actual	9600	
2) 40% of Salary		
(6000×12) ×40%	0	
3) Rent paid - 10% Salary	28800	
(200×12) - (72000×10%)		
14400 7200	7200	7200
Taxable HRA		2400

24/2/22

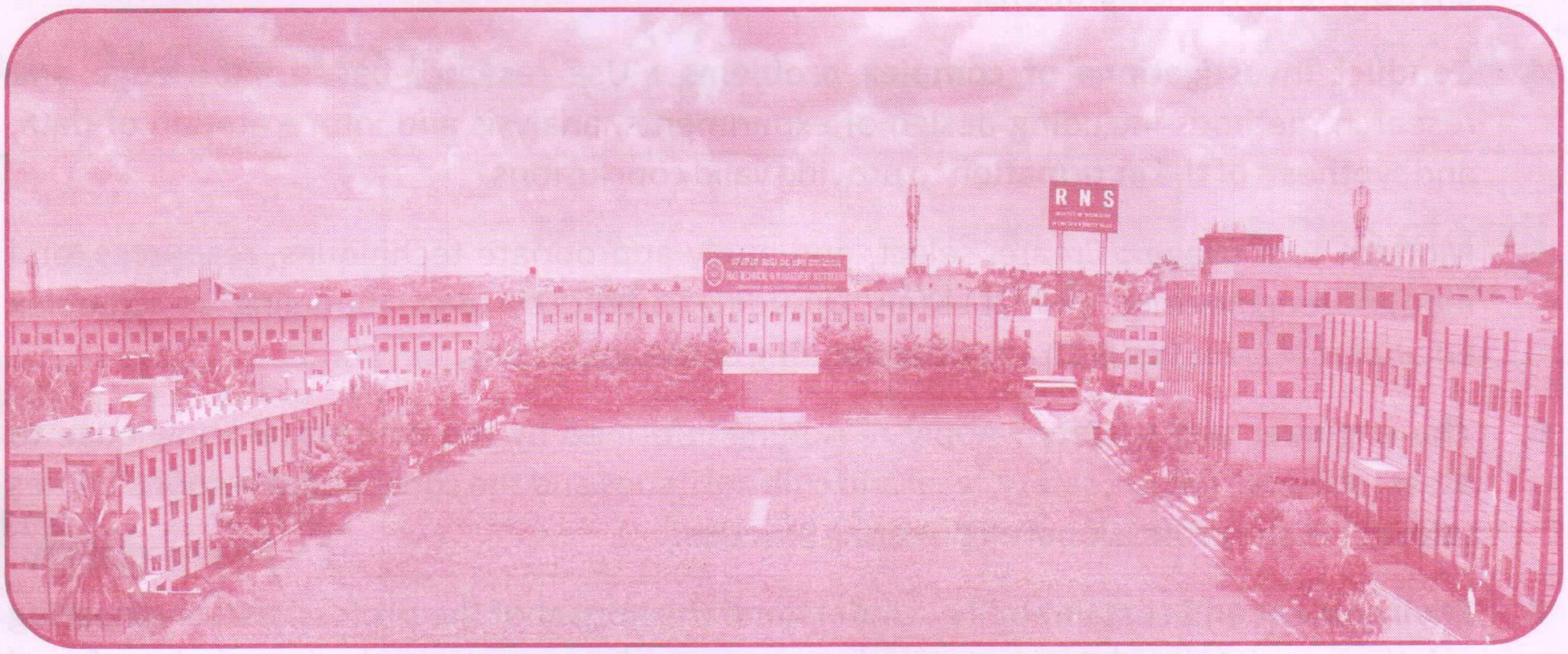
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ASSIGNMENT BOOKLET

Name : Akhil. K.P

USN : 1RN21MC004

Semester : I Sem Sec :

Subject : Mathematics.

Sub Code : 20MCA14

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Name of the Student : AKHIL .K.P

USN : | 1 | R | N | 2 | 1 | M | C | 0 | 0 | 4 |

Semster : 1 **Section :** —

Sub : MATHEMATICS **Sub Code :** 20MCA14

Assignment	Max Marks	Marks Awarded	Initials of Staff with Date
Assignment - 1	10	9	
Assignment - 2	10	10	
Assignment - 3	10	10	

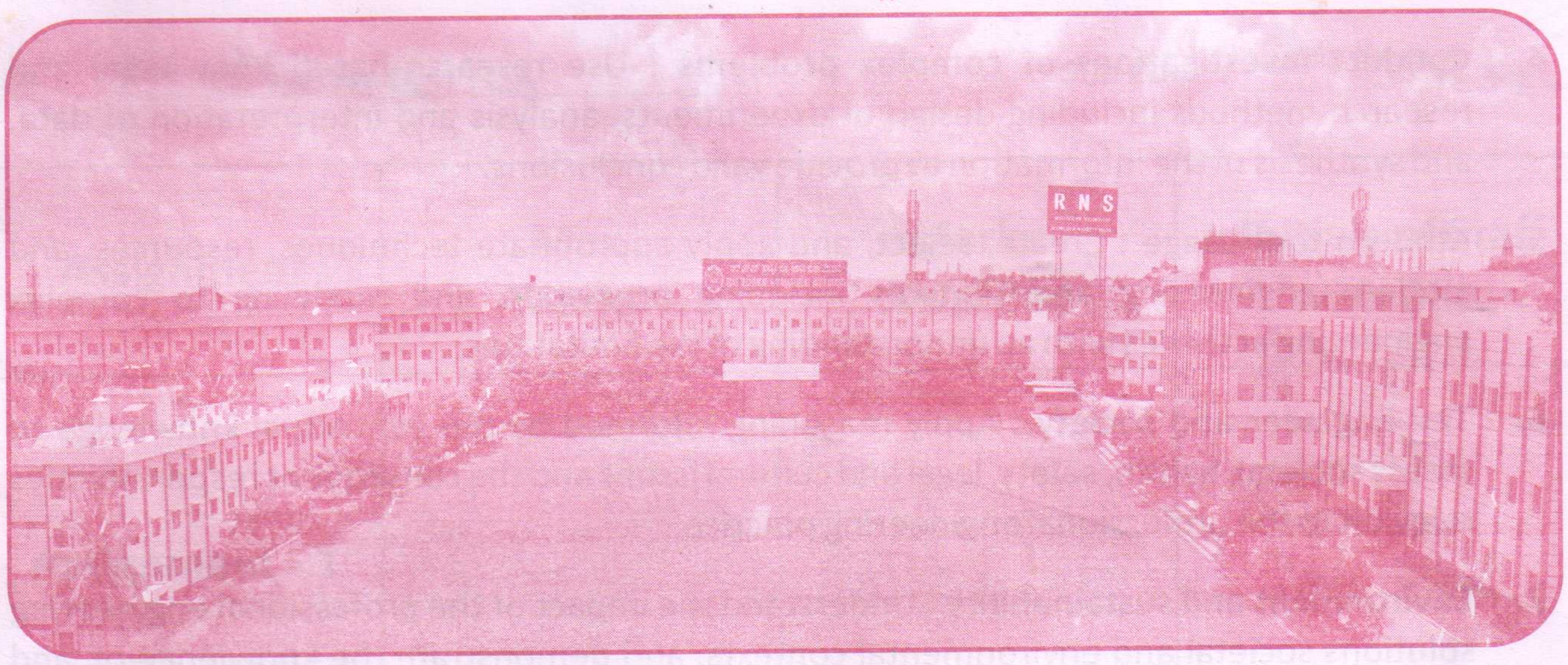
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ASSIGNMENT BOOKLET

Name : Rakshith B.R.

USN : 1RN21MC038

Semester : I. Sec :

Subject : MFCA

Sub Code : 20MCA14

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Name of the Student : Rakshith B.R.

USN : 1 R N 2 1 M C 0 0 4

Semster : I

Section : —

Sub : Mathematics

Sub Code : 20MCA14

Assignment	Max Marks	Marks Awarded	Initials of Staff with Date
Assignment - 1	10	9	
Assignment - 2	10	10	
Assignment - 3	10	10	

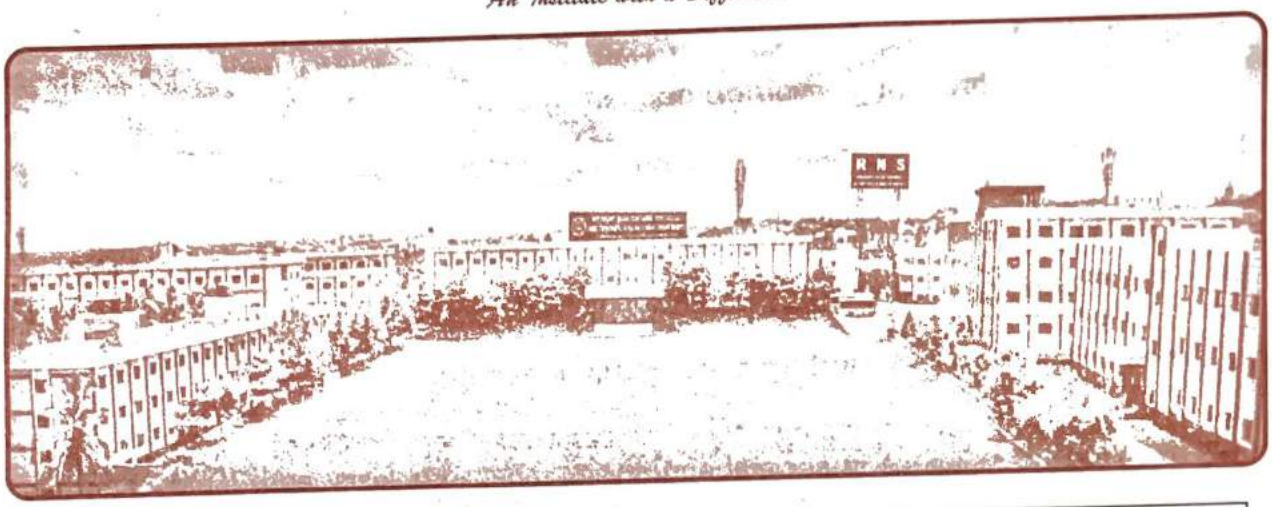
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ASSIGNMENT BOOKLET

Name : VIJAY KUMAR hyati

USN : 1RN21ME455

Semester : 4th Sec : B

Subject : fluid mechanics (FM)

Sub Code : 18ME43

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Name of the Student : VIJAY KUMAR hyati

USN : 1 RN21MC455 Semester : 4th Section : B

Sub : fluid mechanics Sub Code : 18ME43

Assignment	Max Marks	Marks Awarded	Initials of Staff with Date
Assignment-1	6	6	21/6/20
Assignment-2	6	6	22/7/20
Assignment-3	6	6	20/08/20
Average Assignment Marks	6	6	20/08/2020

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Estd : 2001

Name of the Student: CHANDAN S USN 1RN18CS034

Subject: Internet of things Sub Code 18CS81

Date		MARKS AWARDED										Marks Obtained / Max Marks	Initials with Date
	Q	1	2	3	4	5	6	7	8	9	10		
Test - 1	a		6		4		6	5			5	45/50	Staff
	b		4		4		2	5			4		
	c						1						Student
04/05/22	Total		10		8		8	10			9		
Test - 2	a		6		6			5		6		38/50	Staff
	b		4		1	3		4		3			
	c												Student
28/05/22	Total		10		7	3		9		9			
Test - 3	a	6		3			5	6		6		44/50	Staff
	b	4		3			3	4		4			
	c												Student
28/06/22	Total	10		6			8	10		10			

Q1	Q2	Q3	A1	A2	A3	Total Marks	
7	7		10	10	10	127/150	Staff
10	10		10	10	10		Student

Details / Marks	Test Average	Written Quizzes	Assignment	Unit Tests	Final IA Marks	
Marks Obtained	13	2	3	20	40	Staff
Max. Marks	15	2	3	20	40	Student

Signature of the Staff

Signature of the HOD

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Name of the Student: Hemanth.D USN: 1RN18CS046

Subject: Internet of Things Sub. Code: 18CS81

Date		MARKS AWARDED										Marks Obtained / Max Marks	Initials with Date
	Q	1	2	3	4	5	6	7	8	9	10		
Test - 1 04/05/22 dd / mm / yy	a	6		6		8		5		4		43 / 50	Staff
	b	3		3		1		5		2			
	c												Student
	Total	9		9		9		10		6			
Test - 2 28/05/22 dd / mm / yy	a				6		6	6		4		38 / 50	Staff
	b		4		6			4		4			
	c				9					4			Student
	Total		4		10		6	10		8			
Test - 3 28/06/22 dd / mm / yy	a	6		6	1		5		5			44 / 50	Staff
	b	4		4			5		5		4		
	c												Student
	Total	10		10			10		10		4		

Q1	Q2	Q3	A1	A2	A3	Total Marks		
7	7	1	10	10	10	125 / 150	Staff	
10	10		10	10	10		Student	

Details / Marks	Test Average	Written Quizzes	Assignment	Unit Tests	Final IA Marks	
Marks Obtained	13	2	3	20	38	Staff
Max. Marks	15	2	3	20	40	Student

Signature of the Staff

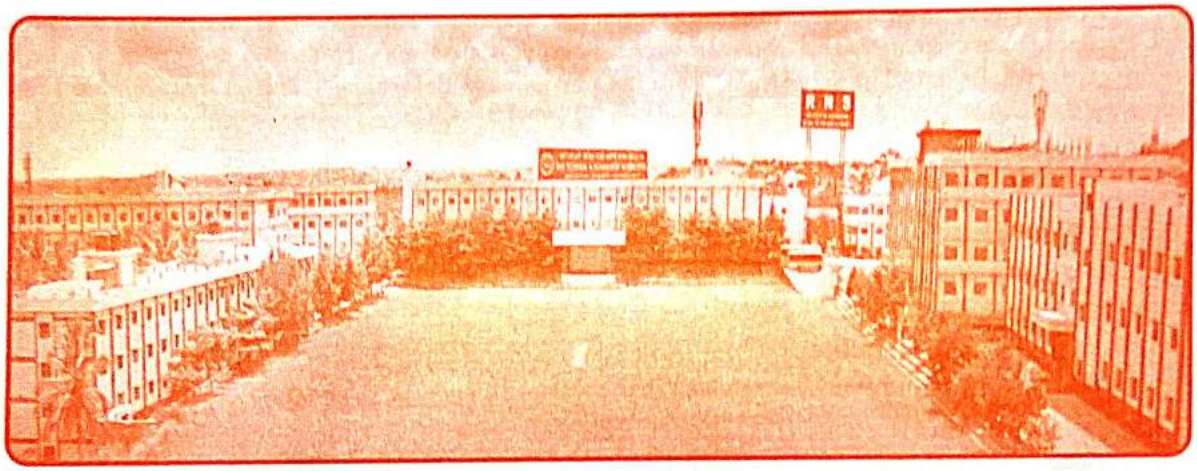
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Answer Booklet

NAME : EKLOVEYA JAIN

USN : 1RN19CV009

SEMESTER : V

SUBJECT : ~~RC 5bb~~ RC STRUCTURAL ELEMENTS

	Test 1	Test 2	Test 3
Signature of the Room Invigilator :		Apoorva	
Date :	27/11	2/12/21	28/11

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Estd : 2001

Name of the Student: EKLOVEYA JAIN USN: 1RN19CV009

Subject: RC STRUCTURAL ELEMENTS Sub. Code: 18CV53

Date		MARKS AWARDED										Marks Obtained / Max Marks	Initials with Date
	Q	1	2	3	4	5	6	7	8	9	10		
Test - 1	a	6		8		3+1	7	3			8	45/50	DN 29/11/2021 Staff
	b	4		2				7					
	c						✓	✓			✓		Student
dd / mm / yy	Total	10		10		3+1=4	7	10			8		
Test - 2	a	10			7	15			1			36/50	DN 22/12/21 Staff
	b								3				
	c												Student
dd / mm / yy	Total	10			7	15			4				
Test - 3	a	20			10	20						50/50	DN 29/11/22 Staff
	b												
	c												Student
dd / mm / yy	Total	20			10	20							

Q1	Q2	A1	A2	A3
07	04	30	30	
10	10	30	30	

Total Marks: 131 / 150

DN 4/2/22 Staff

Student

Details / Marks	Test Average	Written Quizzes	Assignments	Unit Tests	Final IA Marks
Marks Obtained	27	03	06		36
Max. Marks	30	04	06		40

DN 4/2/22 Staff

Student

Thirty six only

Signature of the Staff

Signature of the HOD

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Name of the Student: Anil kumar RY USN: 1RN20EC400

Subject: Digital communication Sub. Code: 18EC61

Date		MARKS AWARDED										Marks Obtained / Max Marks	Initials with Date
	Q	1	2	3	4	5	6	7	8	9	10		
Test - 1 09-05-22 dd / mm / yy	a	4					4	5				33/50	4/5/22 Staff
	b	6			4		5	2			3		
	c												Anilkumar Student
	Total	10			4		9	~~8~~			3		
Test - 2 09/06/22 dd / mm / yy	a	5		5		7			1	7		42/50	28/6/22 Staff
	b	5				3			6	3			
	c												Anil Kumar Student
	Total	10		5		10			7	10			
Test - 3 07/07/22 dd / mm / yy	a	6				5			6	4		40/50	12/7/22 Staff
	b	4		1		4			4	6			
	c												Anilkumar Student
	Total	10		1		9			10	10			

Q1	Q2	A1	A2	A3
0	4	3	3	—
10	10	3	3	—

30 Total Marks

115

Staff

150

Anil Kumar Student

Details / Marks	Test Average	Written Quizzes	Assignments	Unit Tests	Final IA Marks	Staff
Marks Obtained	23	0.8	06	-	30	Anil Kumar Student
Max. Marks	30	04	06		40	

15/7/22
Signature of the Staff

Signature of the HOD

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Name of the Student: Gagana Shree B USN: 1RN19EE012

Subject: Power System Analysis - I Sub. Code: 18EE62

Date		MARKS AWARDED										Marks Obtained / Max Marks	Initials with Date
	Q	1	2	3	4	5	6	7	8	9	10		
Test - 1 10/5/22 dd / mm / yy	a	4		10		10		24		8		46/50	Staff
	b	6						5					
	c												Student
	Total	10	-	10	-	10	-	8	-	8			
Test - 2 11/6/22 dd / mm / yy	a	24	2	4		6		3		10		44/50	Staff
	b	4		6		4		4					
	c	7	extra										Student
	Total	8	2	10	-	10	-	7	-	10	-		
Test - 3 7/7/22. dd / mm / yy	a	10		8		8		6		6		48/50	Staff
	b			2				4		4			
	c												Student
	Total	10		10		8		10		10			

Q1	Q2	Q3	A1	A2	A3	Total Marks		
7	7		3	3			138	Staff
10	10		3	3			150	Student

Details / Marks	Test Average	Written Quizzes	Assignment	Unit Tests	Final IA Marks	
Marks Obtained	28	4	6		38	Staff
Max. Marks	30	4	6		40	Student

Signature of the Staff

Signature of the HOD

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Name of the Student : Pavana . M

USN : 1 R N 2 0 E E 0 2 9 Semester : IV Section : —

Sub : Electric Motors Sub Code : 18EE44

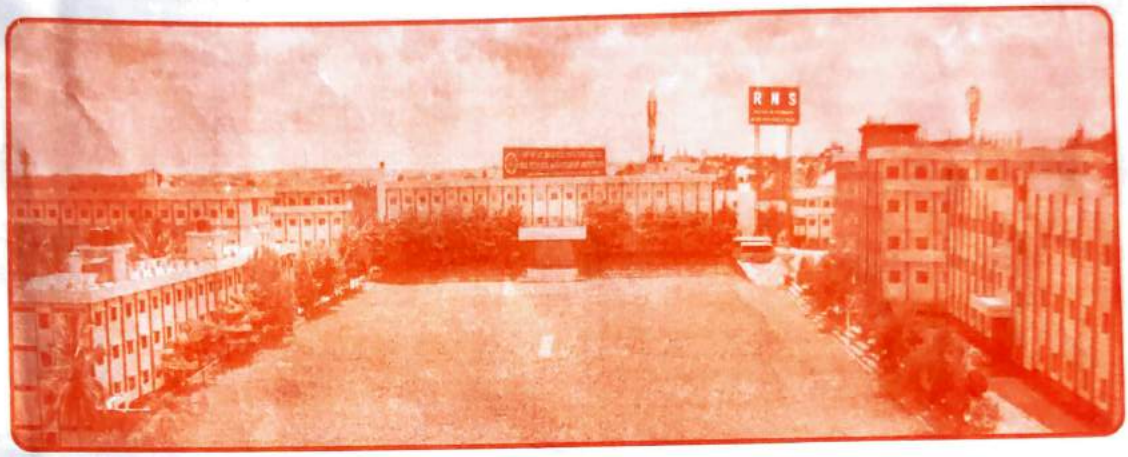
Assignment	Max Marks	Marks Awarded	Initials of Staff with Date
Assignment-1	10	10	29/7
Assignment-2	10	10	19/8
Assignment-3			
Average Assignment Marks	10	10	19/8

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Answer Booklet

NAME : HARSHITHA R

USN : 1RN19EI013

SEMESTER : VI

SUBJECT : Power and Industrial Electronics

	Test 1	Test 2	Test 3
Signature of the Room Invigilator :			
Date :	9/5/22	11/6/22	9/7/22

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Name of the Student: HARSHITHA R. USN: 1RN19EI013

Subject: Power and Industrial Electronics Sub. Code: 18EI62

Date		MARKS AWARDED											Marks Obtained / Max Marks	Initials with Date
	Q	1	2	3	4	5	6	7	8	9	10			
Test - 1 09/05/22 dd / mm / yy	a		7		5		1	6			6		46/50	Staff
	b		3		5		5	4			4			Harshitha.R. Student
	c													
	Total		10		10		6	10			10			
Test - 2 11/06/22 dd / mm / yy	a	7			6		7	5			6		50/50	Staff
	b	3			4		3	5			4			Harshitha.R. Student
	c													
	Total													
Test - 3 9/7/22 dd / mm / yy	a	7		6		6		5		6			50/50	Staff
	b	3		4		4		5		4				Harshitha R Student
	c													
	Total	10		10		10		10		10				

Q1	Q2	A1	A2	A3
9	9	2	2	2
10	10	2	2	2

Total Marks: 145 / 150 — Staff; Harshitha R Student

Details / Marks	Test Average	Written Quizzes	Assignments	Unit Tests	Final IA Marks	Staff
Marks Obtained	29.2	4	6	-	~~30~~ 40	Harshitha R. Student
Max. Marks	30	4	6	-	40	

Signature of the Staff

Signature of the HOD

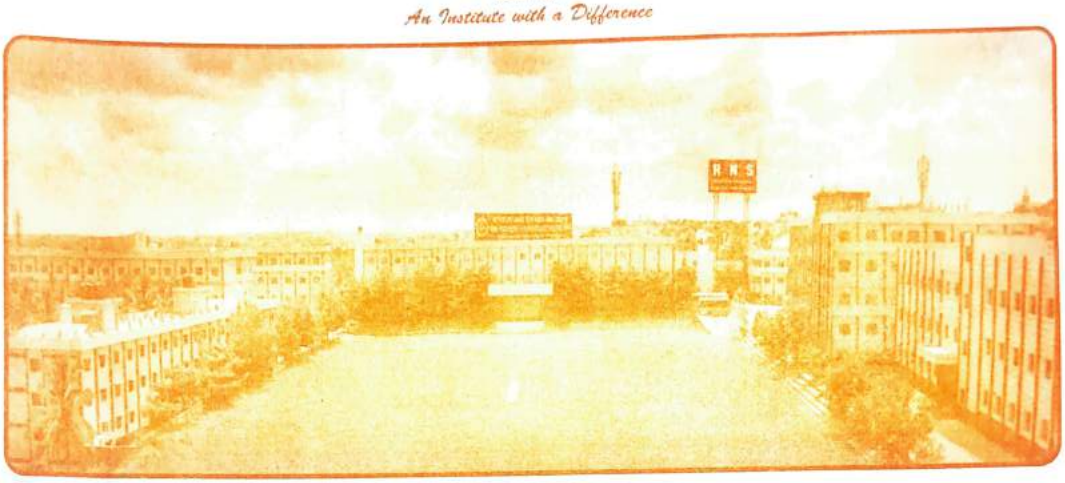
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Answer Booklet

NAME : D. Yakshitha

USN : 1RN18IS035

SEMESTER : VII

SUBJECT : Cryptography

	Test 1	Test 2	Test 3
Signature of the Room Invigilator :			
Date :	24/11/21	21/12/21	28/1/22

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Name of the Student: D. Yakshitha USN: 1RN18IS035

Subject: Cryptography. Sub. Code: 18CS744.

Date		MARKS AWARDED										Marks Obtained / Max Marks	Initials with Date
	Q	1	2	3	4	5	6	7	8	9	10		
Test - 1	a		3		4	4	2		4	4		48/50	Staff
24-11-21	b		6		6	6	1		5	4			
dd / mm / yy	c												Student
	Total		9		10	10			9	8			
21-12-21	a		6	6		6			10		10	50/50	Staff
Test - 2	b		4	4		4							
	c												Student
dd / mm / yy	Total		10	10		10			10		10		
	a		6	6			6	6		6		50/50	Staff
Test - 3	b		4	4			4	4		4			
28/1/22	c												Student
dd / mm / yy	Total		10	10			10	10		10			

Q1	Q2	Q3	A1	A2	A3	Total Marks		Staff / Student
8	8		6	6				Staff
10	10		6	6				Student

Details / Marks	Test Average	Written Quizzes	Assignment	Unit Tests	Final IA Marks	Staff / Student
Marks Obtained	30	4	6		40	Staff
Max. Marks	30	4	6		40	Student

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Answer Booklet - MBA

NAME : Amruta V. Akkimardi

USN : 1RN20BA016.

SEMESTER : MBA IIIrd Sem.

SUBJECT : Direct taxation.

	Test 1	Test 2	Test 3
Signature of the Room Invigilator :			
Date :	21/12/2021	18/01/22	18/02/2022

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Estd : 2001

Student Name Amruta V. Akkimardi USN 1RN20BA016 Sec

Subject Direct taxation. Sub. Code

Test No.	Date of Test	Q	MARKS AWARDED 1	2	3	4	Total	Initials with Date Staff	Student
T_1	21/12/21	a	2	3	-	10	42	24/12/21	Amruta
		b	6	6	-				
		c	5	10	-		50		
		Total	13	19	-	10			
T_2	18/1/2022	a	-	3	3	8	44	28/1/22	Amruta 28/1/22
		b	-	6	6				
		c	-	8	10		50		
		Total	-	17	19	8			
T_3	8/2/22	a	3	3	0	6	38	22/2/22	Amruta
		b	6	3	7				
		c	6	7	10		50		
		Total	15	(13)	17	6			
Total of the ~~better~~ marks obtained from ~~any two~~ 3 tests							124 ~~100~~ 150		

FINAL IA MARKS COMPUTATION

Rubrics	Marks Awarded	Maximum Marks	Initials with Date Staff	Student
Test	21	25	3/3/2022	
Assignment / Quiz	5	05		
Oral Exam / Subject Viva	5	05		
Seminar / Presentation	5	05		
FINAL IA MARKS	36	40		

3/3/2022

Signature of the Staff

Signature of the HOD

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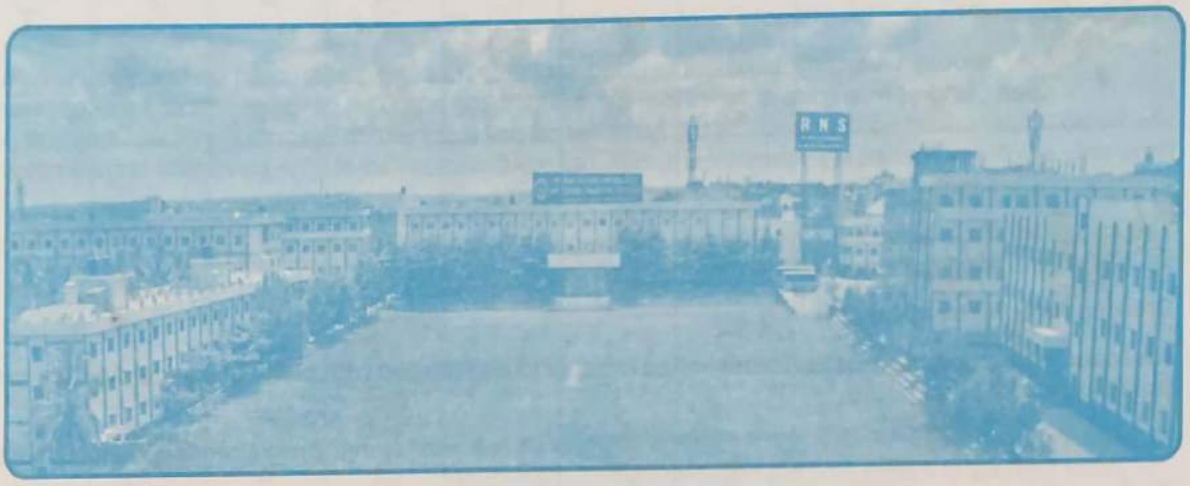
CORE FINANCE

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ESTD : 2001

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ABCs of RNSIT : ALWAYS BE CHEERFUL!! AVOID BAD COMPANY!!

Answer Booklet - MBA

NAME : Bhoomika Jayashankar

USN : 1RN20BA037

SEMESTER : III Sem [Core finance]

SUBJECT : Direct Taxation

	Test 1	Test 2	Test 3
Signature of the Room Invigilator :			
Date :	21/12/2021	08/01/22	08/02/2022

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Estd : 2001

Student Name Bhoomika Jayashankar USN 1RN20BA037 Sec Core finance

Subject Direct Taxation Sub. Code 20MBAFM304

Test No.	Date of Test	MARKS AWARDED Q	1	2	3	4	Total	Initials with Date Staff	Student
T_1	21/12/21	a	0	3	–	8	~~37~~ 41	23/12/21	
		b	6	4	–				
		c	10	10	8		50		
		Total	16	17	8	8			
T_2	15/1/22	a	3	3	3	8	41	25/1/22	
		b	–	3	4				
		c	2	10	10		50		
		Total	10	16	17	8			
T_3	18/2/22	a	0		1	8	33	22/2/22	
		b	6		3				
		c	5		10		50		
		Total	11		14	8			
Total of the better marks obtained from any two tests							115 ~~100~~ 150		

FINAL IA MARKS COMPUTATION

Rubrics	Marks Awarded	Maximum Marks	Initials with Date Staff	Student
Test	20	25	3/3/2022	
Assignment / Quiz	5	05		
Oral Exam / Subject Viva	5	05		
Seminar / Presentation	5	05		
FINAL IA MARKS	35	40		

3/3/2022

Signature of the Staff

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Core Finance

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ESTD : 2001

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Answer Booklet - MBA

NAME : Abrar Ahmed

USN : 1RN20BA005

SEMESTER : III Sem

SUBJECT : Direct Taxation

	Test 1	Test 2	Test 3
Signature of the Room Invigilator :			
Date :	21/12/2021	18/01/22	8/02/22

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Estd : 2001

Student Name Abrar Ahmed USN 1RN20BA005 Sec

Subject Sub. Code

Test No.	Date of Test	Q	MARKS AWARDED 1	2	3	4	Total	Initials with Date Staff	Student
T_1	21/12/21	a	1	—	3	8	43	24/12/21	30/12/2021
		b	6	—	7				
		c	10	—	8		50		
		Total	17	—	18	8			
T_2	18/1/22	a	3	2	3	8	45	25/1/22	28/01/22
		b	6	5	5				
		c	10	10	10		50		
		Total	19	18	18	8			
T_3	18/2/22	a	2	3	2	7	40	22/2/22	23/0/22
		b	6	5	3				
		c	6	10	10		50		
		Total	14	18	15	7			
Total of the ~~better~~ marks obtained from ~~any two~~ tests					3		128		
							100		

FINAL IA MARKS COMPUTATION

Rubrics	Marks Awarded	Maximum Marks	Initials with Date Staff	Student
Test	22	25		
Assignment / Quiz	5	05		
Oral Exam / Subject Viva	5	05	3/3/2022	
Seminar / Presentation	5	05		
FINAL IA MARKS	37	40		

Signature of the Staff 3/3/2022

Signature of the HOD

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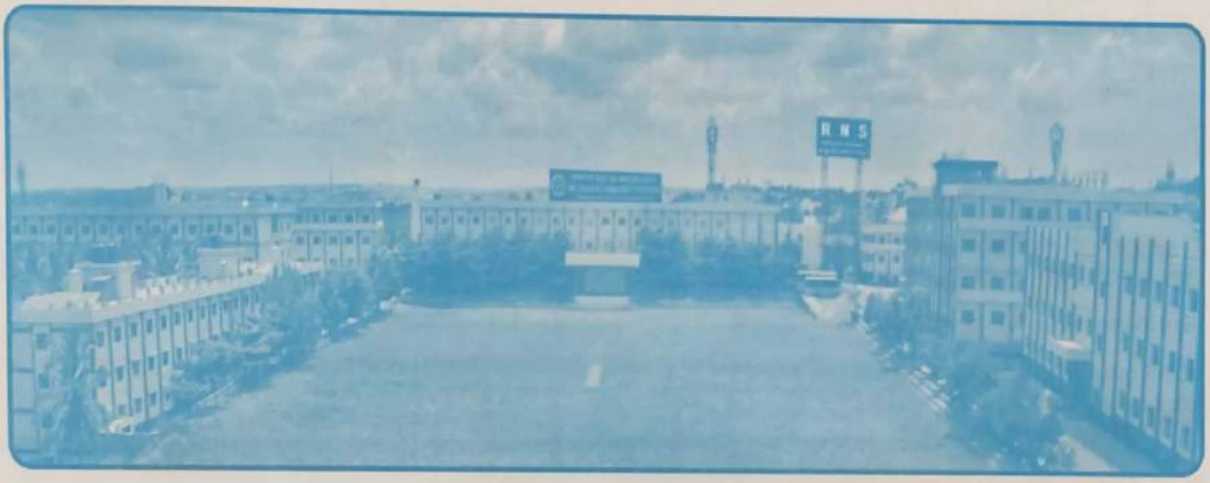
Core Finance

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Answer Booklet - MBA

NAME : Harshitha.P.G

USN : 1RN20BA057

SEMESTER : 3rd Sem

SUBJECT : Direct Taxation

	Test 1	Test 2	Test 3
Signature of the Room Invigilator :			
Date :	21/12/2024	8/01/22	18/02/2022

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Estd : 2001

Student Name Harshitha.P.G USN 1RN20BA057 Sec

Subject Direct Taxation Sub. Code 20MBAFM304

Test No.	Date of Test	Q	1	2	3	4	Total	Initials with Date: Staff	Initials with Date: Student
T_1	21/12/21	a	0	3	—	10	37	24/12/21	Harshitha.P.G
		b	5	-	-				
		c	10	9	-		50		
		Total	15	12	—	10			
T_2	18/1/22	a	3	-	-	9	27	25/1/2022	Harshitha P.G 28/1/22
		b	2	-	-				
		c	6	7	-		50		
		Total	11	7	—	9			
T_3	18/2/22	a		0	3	7	30	22/2/22	Harshitha.P.G 24/2/22
		b		2	4				
		c		5	9		50		
		Total		7	16	7			
Total of the ~~better~~ marks obtained from ~~any two~~ 3 tests							94 ~~100~~ 150		

FINAL IA MARKS COMPUTATION

Rubrics	Marks Awarded	Maximum Marks	Initials with Date: Staff	Initials with Date: Student
Test	16	25	3/3/2022	
Assignment / Quiz	5	05		
Oral Exam / Subject Viva	5	05		
Seminar / Presentation	5	05		
FINAL IA MARKS	31	40		

3/3/2022

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Core finance

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ESTD : 2001

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Answer Booklet - MBA

NAME : Keerthi. P. L

USN : 1RN20BA065

SEMESTER : III

SUBJECT : Direct taxation

	Test 1	Test 2	Test 3
Signature of the Room Invigilator :			
Date :	21/12/2021	18/01/22	18/02/2022

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Estd 2001

Student Name Keerthi P. L USN 1RN20BA065 Sec F

Subject Direct Taxation Sub. Code 304

Test No.	Date of Test	Q	MARKS AWARDED 1	2	3	4	Total	Initials with Date Staff	Student
T_1	21/12/21	a	2	3	3	10	48	24/12/21	
		b	6	7	7				
		c	8	10	8		50		
		Total	16	20	18	10			
T_2	18/1/2022	a	3		3	10	49	25/1/2022	
		b	7		6				
		c	10		10		50		
		Total	20	–	19	10			
T_3	19/2/22	a	3		3	9	47	20/2/22	
		b	7		5				
		c	10		10		50		
		Total	20		18	9			
Total of the better marks obtained from any two tests							144 ~~100~~ 150		

FINAL IA MARKS COMPUTATION

Rubrics	Marks Awarded	Maximum Marks	Initials with Date Staff	Student
Test	24	25	3/3/22	
Assignment / Quiz	5	05		
Oral Exam / Subject Viva	5	05		
Seminar / Presentation	5	05		
FINAL IA MARKS	39	40		

3/3/2022
Signature of the Staff

Signature of the HOD

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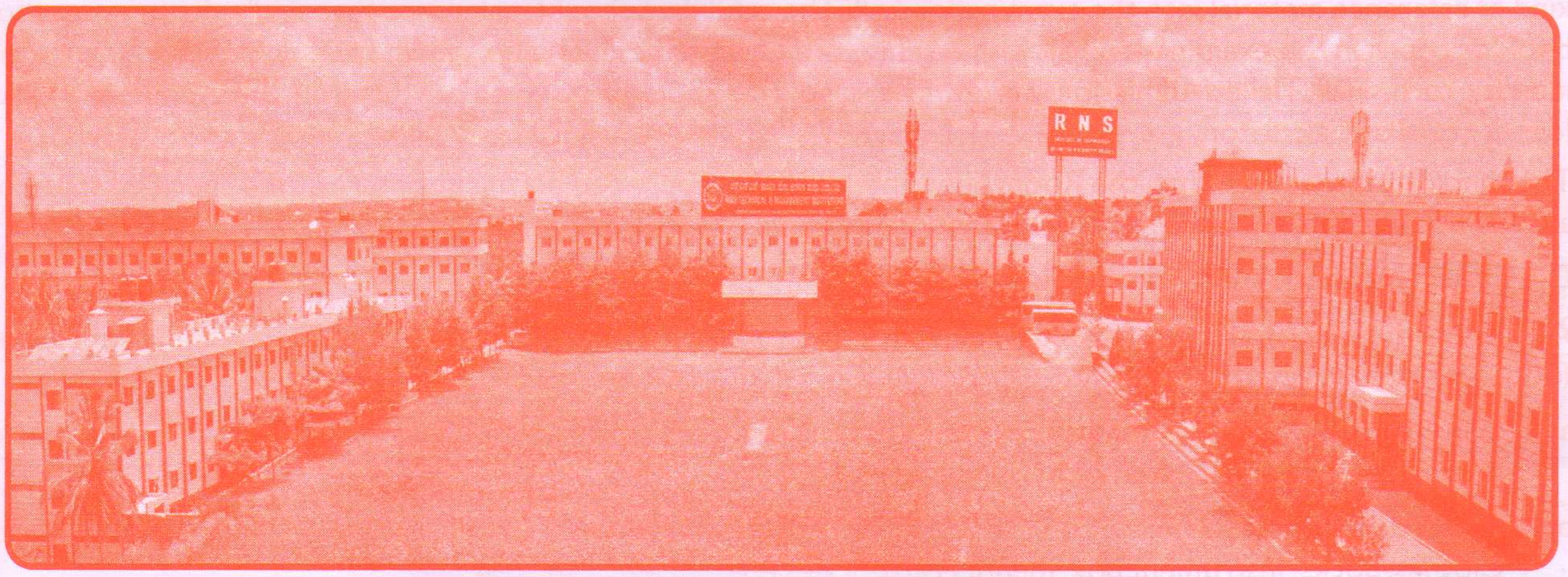
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Answer Booklet

NAME : Akhil.K.P

USN : 1RN21MC-004

SEMESTER : I MCA

SUBJECT : Mathematics

	Test 1	Test 2	Test 3
Signature of the Room Invigilator :			
Date :	31/03/22	10/5/22	24/5/22

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Name of the Student: Akhil. K. P **USN:** 1RN21MC-004

Subject: Mathematics **Sub. Code:** 20MCA14

Date		MARKS AWARDED										Marks Obtained / Max Marks	Initials with Date
	Q	1	2	3	4	5	6	7	8	9	10		
Test - 1	a		5	6		1			5	5		44/50	6/4/22 Staff
	b		5	4		3			5	5			
	c												7/4/22 Student
31/03/22	Total		10	10		4			10	10			
Test - 2	a	2		7			6					49/50	13/5/22 Staff
	b	8		3			4						
	c												16/5/22 Student
dd / mm / yy	Total	10		10			10		9		10		
Test - 3	a						5		5			28/50	26/5/22 Staff
	b						5		3				
	c												27/5/22 Student
dd / mm / yy	Total		10				10		8				

Q1	Q2	Q3	A1	A2	A3
6	5	6	10	10	10
10	10	10	10	10	10

$T_1 + T_2$

Total Marks

93

100

26/5/22 Staff

27/5/22 Student

Details / Marks	Test Average	Written Quizzes	Assignments	Unit Tests	Final IA Marks
Marks Obtained	28	5	5		38
Max. Marks	30	5	5		40

26/5/22 Staff

27/5/22 Student

26/5/22

Signature of the Staff

26/5/22

Signature of the HOD

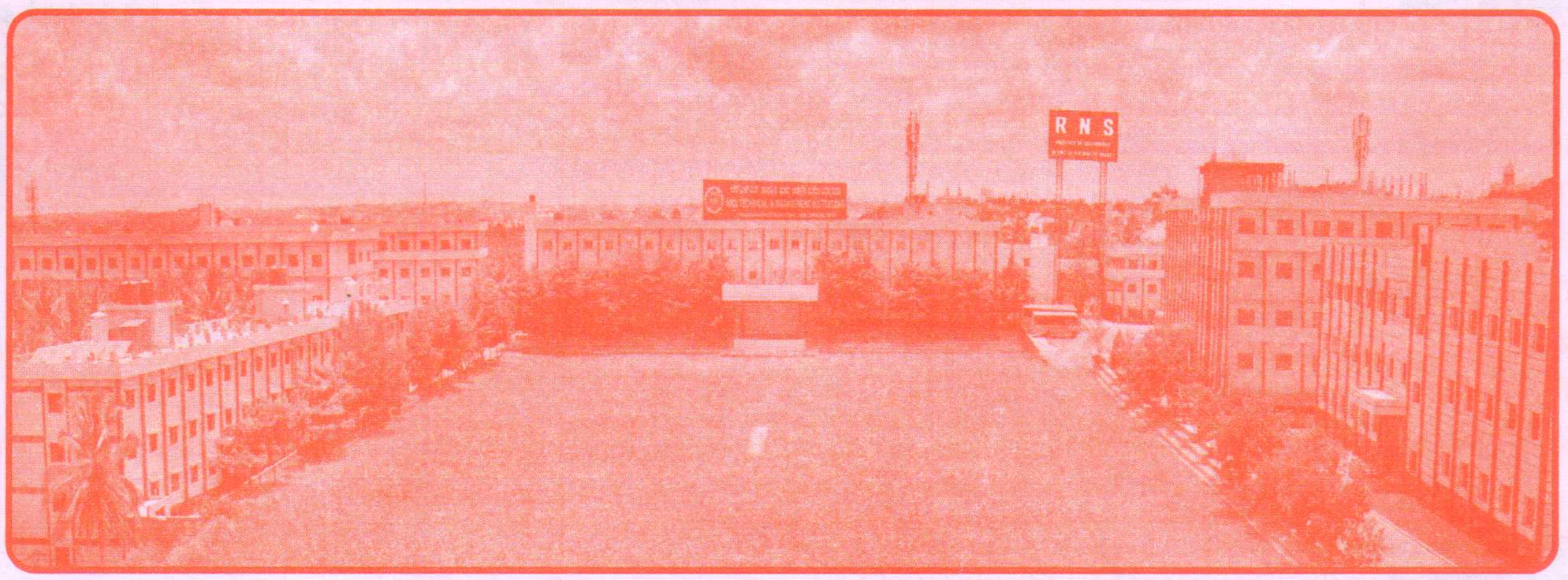
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Answer Booklet

NAME : Rakshith. B.R.

USN : 1RN21MC038

SEMESTER : I

SUBJECT : Mathemetical foundation for Computer Aplication

	Test 1	Test 2	Test 3
Signature of the Room Invigilator :			
Date :	31-3-2022	10/05/22.	24/05/2022.

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Dr. Vishnuvardhan Road, Channasandra, RR Nagar, Bengaluru - 560098

Name of the Student: Rakshith. BR **USN:** 1YRN21MC038

Subject: Mathematical foundation for. **Sub. Code:** 20MCA1H.

Date	Q	1	2	3	4	5	6	7	8	9	10	Marks Obtained / Max Marks	Initials with Date
Test - 1 07/04/22 dd / mm / yy	a	3		5		2			3		5	40	Staff
	b	4		4		4			3		5	38/50	Student
	c	3											Rakshith 07/04/22
	Total	10		5+4		6			3		10		
Test - 2 dd / mm / yy	a		6	7			6					36+2	Staff
	b		2	3			4					50	Student
	c												Rakshith.
	Total		8+2	10			10		8				
Test - 3 dd / mm / yy	a			5		5		5				50/50	Staff
	b			5		5		6					Student
	c												Rakshith 27/05/22
	Total		10	10		10		10			10		

Q1	Q2	A1	A2	A3
2	8/2	10	10	10
10	10/10	10	10	10

$T_1 + T_3$ **Total Marks**

90	Staff
100	Student

Details / Marks	Test Average	Written Quizzes	Assignments	Unit Tests	Final IA Marks	
Marks Obtained	27	5	5		37	Staff
Max. Marks	30	5	5		40	Student

Signature of the Staff

Signature of the HOD

A. SEC (4)

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Answer Booklet

NAME : ABHISHEK. C. GONAGIMATH

USN : 1RN18ME005

SEMESTER : 8th

SUBJECT : ENERGY ENGINEERING

	Test 1	Test 2	Test 3
Signature of the Room invigilator :			
Date :	4/5/22	28/05/2022	28/6/22

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Estd : 2001

Name of the Student: Abhishek. C. Gonagimath USN: 1RN18MED05

Subject: Energy Engineering Sub. Code: 18ME81

Date		MARKS AWARDED										Marks Obtained / Max Marks	Initials with Date
	Q	1	2	3	4	5	6	7	8	9	10		
Test - 1 04/05/22 dd / mm / yy	a	2			0		2	5			4	41/50	4/5/22 Staff
	b	8			8		8				4		Student
	c												
	Total	10			8		10	5			8		
Test - 2 28/05/22 dd / mm / yy	a	2		2		5					3	33/50	28/5/22 Staff
	b	8		6		5					2		Student
	c												
	Total	10		8		10					5		
Test - 3 28/06/22 dd / mm / yy	a	3		5		10		3			3	42/50	30/6/22 Staff
	b	5		3				5			5		Student
	c												
	Total	8		8		10		8			8		

Q1	Q2	A1	A2	A3
9	2	2	2	2

Total Marks 24/30

1/7/22 Staff

Student

Details / Marks	Test Average	Written Quizzes	Assignments	Unit Tests	Final IA Marks
Marks Obtained	24	3	6	–	33
Max. Marks	30	4	6	–	40

1/7/22 Staff

Student

1/7/22
Signature of the Staff

Signature of the HOD

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(**AICTE** Approved, **VTU** Affiliated and **NAAC 'A'** Accredited)
(**UG programs** – CSE, ECE, ISE, EIE and EEE are **Accredited** by **NBA** up to **30.6.2025**)
Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098

Ref No.: RNSIT/2022-2023/30

Date: 18.08.2022

The Registrar (Evaluation)
Visvesvaraya Technological University
Belagavi-590 018

Sir,

Sub: Declaration of RV Results - reg

Please arrange to declare RV results of candidates with details as under:

Sl. No.	Name	USN	Subject in which results are pending
1	Krishna Nandha P S	1RN21EC066	21MAT11, 21PSP13, 21ELN14
2	Kushi M S	1RN21EC063	21PSP13,21EME15,21ELN14

We will be looking forward to hearing from you for a favorable response.

Thanking you,

Yours sincerely,

(Dr. M K Venkatesha)
Principal

18/8/22

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru-560 098

RNS INSTITUTE OF TECHNOLOGY

(AICTE Approved, VTU Affiliated and NAAC 'A' Accredited)
(UG Programs - CSE, ECE, ISE, EIE and EEE have been Accredited by NBA for the Academic years 2022-2025)
Channasandra, Dr.Vishnuvardhan Road, Bengaluru-560098

Date:16/08/2022

To,

The Registrar (Evaluation)
Visvesvaraya Technological University
Belagavi-590018

Respected Sir,

Subject: Discrepancy in 6th semester, July/August 2022 for the subject Python Application Programming (18EC646).

This is to bring to your kind notice that there are some discrepancies identified in the Python Application Programming (18EC646) question paper appeared on 16/8/2022 for 6th semester students. The discrepancies as listed in the table below.

Sl No.	Question Number	Query
1	5c	Can students assume any character ?
2	6a. Compare and contrast tuples with **tests.** 6a (iii) Compression of two tuples	In 6a should Compare and contrast tuples with **lists?** In 6a(iii), **Comparison/concatenation** of tuples?

We request you to look into these discrepancies in the interest of students and do the needful
Thanking you

Yours faithfully
ARK 16/8
Dr. Archana Kulkarni
Associate Professor,Dept of ECE

Dr Nandini KS 16/8
Assistant Professor, Dept of ECE

Recommended & forwarded for consideration.

17/8/22

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru-560 098

Rep(Eval):

To

Registrar (Evaluation)

VTU,

Belagavi.

Through Principal,

Through HOD-EEE

Sub: Regarding Corrections in the Question paper 18EE63 (Digital Signal Processing)

The following discrepancies were found in the above said Question paper for which the examination was conducted on 10-8-2022. Please consider the request and do the needful justice to the student community.

1. Module 3: QNo.6b Pass band frequency has not been mentioned.
2. Module 3: QNo.6c , second part cut off frequency is not mentioned.

Thanking you

Yours faithfully

Mrs. Sony Venugopal

Asst.Professor

RNS Institute of Technology

Bangalore.

11/8/22

Submitted/ Req (Eval) for kind consideration.

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru-560 098

12.8.22

Req (Eval):

CBCS SCHEME

USN | 1 | R | N | 1 | 9 | E | E | 0 | 3 | 7 |

18EE63

Sixth Semester B.E. Degree Examination, July/August 2022
Digital Signal Processing

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Compute 4-point DFT of casual three sample sequence given by

$x(n) = \frac{1}{3}; 0 \le n \le 2$

$= 0$; else. **(06 Marks)**

b. State and prove linearity property of DFT. **(06 Marks)**

c. Find the circular convolution of two finite duration sequences $x_1(n)$ and $x_2(n)$ using concentric circle method. Where $x_1(n)$ and $x_2(n)$ are given by

$x_1(n) = \{1, -1, -2, 3, -1\}$

$x_2(n) = \{1, 2, 3\}$. **(08 Marks)**

OR

2 a. Compute circular convolution using Stockham's method for following sequences:

$x_1(n) = \{2, 3, 1, 1\}$ and $x_2(n) = \{1, 3, 5, 3\}$. **(10 Marks)**

b. Find the output y(n) of a filter whose impulse response h(n) = (1, 2) and input signal x(n) = {1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1} using overlap save method. Use block length of N = 4. **(10 Marks)**

Module-2

3 a. Develop decimation in time algorithm for finding FFT. Draw signal flow graph for N = 8 for DIT algorithm. **(10 Marks)**

b. Find the 8 point DFT of sequence x(n) = {1, 1, 0, 0, -1, -1, 0, 0} using DIT FFT algorithm. Draw signal flow graph. **(10 Marks)**

OR

4 a. Develop a decimation in frequency FFT algorithm for N = 8. Draw signal flow graph. **(10 Marks)**

b. The DFT X(k) of sequence is given as, $X(k) = \{0, 2\sqrt{2}(1-j), 0, 0, 0, 0, 0, 2\sqrt{2}(1+j)\}$. Determine the corresponding time sequence x(n) using DIF-FFT algorithm. Write its signal flow graph. **(10 Marks)**

Module-3

5 a. A system function of the normalized lowpass filter is given below:

$H(s) = \frac{1}{s^2 + \sqrt{2}s + 1}$. Determine H(z) using impulse invariant transformation. Consider T = 1sec. **(08 Marks)**

b. Design an analog filter with maximally flat response in the passband and an acceptable attenuation of -2dB at 20radians/second. The attenuation in the stop band should be more than 10dB beyond 30 radian/second. **(12 Marks)**

OR

6 a. Transform the analog filter $H(s)=\frac{s+0.1}{(s+0.1)^2+9}$ into a digital filter using bilinear transformation. The digital filter should have resonant frequency $w_r = \pi/4$. **(05 Marks)**

b. Design an analog Chebyshev filter with the following specifications:
Passband ripple: 1dB for $0 \le \Omega \le$ rad/sec. Missing Data
Stopband attenuation : -60dB for $\Omega \ge 50$ rad/sec. **(10 Marks)**

c. Let $H(s)=\frac{1}{s^2+\sqrt{2}s+1}$ represent the transfer function of a lowpass filter with a passband of 1 rad/sec. Use frequency transformation to find the transfer functions of the following analog filters.
i) A lowpass filter with pass band of 10rad/sec
ii) A high pass filter with cut-off frequency of rad/sec. Missing Data **(05 Marks)**

Module-4

7 a. Compare Butterworth and Chebyshev filter approximations. **(05 Marks)**

b. Design a digital low pass filter to satisfy the following pass band ripple $1 \le H(j\Omega) \le 0$, for $0 \le \Omega \le 1404\pi$ rad/sec and stop band attenuation $|H(\Omega)| > 60\text{dB}$ for $\Omega \ge 8268\ \pi$ rad/sec sampling interval $T_s = \frac{1}{10^4}$ sec. Use BLT for designing. **(15 Marks)**

OR

8 A discrete time system H(z) is expressed as

$$H(z)=\frac{10\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{2}{3}z^{-1}\right)\left(1+2z^{-1}\right)}{\left(1-\frac{3}{4}z^{-1}\right)\left(1-\frac{1}{8}z^{-1}\right)\left[1-\left(\frac{1}{2}+j\frac{1}{2}\right)z^{-1}\right]\left[1-\left(\frac{1}{2}-j\frac{1}{2}\right)z^{-1}\right]}.$$

a. For the discrete time system defined by H(z), find the difference equation of the system. **(02 Marks)**

b. For the discrete time system, H(z) realize the system in direct form-I and II. **(08 Marks)**

c. For the discrete time system H(z), realize parallel and cascade forms using second order sections. **(10 Marks)**

Module-5

9 a. The desired frequency response of the low pass filter is given by

$$H_d(e^{jw}) = H_d(w) = \begin{cases} e^{-j3w}; & |w| < 3\pi/4 \\ 0; & 3\pi/4 < |w| < \pi \end{cases}$$

Determine the frequency response of FIR filter if the hamming window is used, with N = 7. **(08 Marks)**

b. Design an ideal band pass filter with frequency response.
$H_d(e^{jw}) = 1$, for $\frac{\pi}{4} \le |w| \le \frac{3\pi}{4}$. Use rectangular window with N = 11 in the design. **(12 Marks)**

OR

10 a. Determine the impulse response h(n) of a filter having desired frequency response.

$$H_d(e^{jw}) = \begin{cases} e^{-j(N-1)w/2} & \text{for } 0 \le |w| \le \pi/2 \\ 0 & \text{for } \frac{\pi}{2} \le |w| \le \pi \end{cases}$$

N = 7, use frequency sampling approach. **(10 Marks)**

b. Realize the following system function $H(z)=1+\frac{3}{4}z^{-1}+\frac{17}{8}z^{-2}+\frac{3}{4}z^{-3}+z^{-4}$ in
i) Direct form ii) Cascaded form. **(10 Marks)**

* * *2 of 2* * *

17k Corrections
12.8.22

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ
VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
KARNATAKA, INDIA

21UG 262730

B.E. Electronics & Communication Engineering August 2021

Name of the Student : GAGANTEJ R T USN: 1RN18EC056

Father's / Mother's Name : T RAGHU

Name of the College : R.N.S. INSTITUTE OF TECHNOLOGY, BANGALORE

Sl. No.	Course Code	Title of the Course Registered	Credits Assigned	Credits Earned (C)	Letter Grade	Grade Point (G)
		IV Semester				
1	18MAT41*	Complex Analysis, Probability & Stat. Method"	3	3	D	6
2	18EC42*	Analog Circuits	4	4	D	6
3	18EC43*	Control Systems	3	0	F	0
4	18EC46*	Microcontroller	3	0	F	0
5	18ECL47*	Microcontroller Laboratory	2	2	B	8
		III Semester				
6	18EC33*	Electronic Devices	3	3	C	7
7	18EC34*	Digital System Design	3	0	F	0
8	18EC35*	Computer Organization & Architecture	3	3	E	4
9	18EC36*	Power Electronics & Instrumentation	3	3	E	4
10	18ECL37*	Electronic Devices & Instrumentation Lab	2	2	C	7
11	18ECL38*	Digital System Design Laboratory	2	2	D	6
		I Semester				
12	18CPS13*	C Programming for Problem Solving	3	3	E	4

* Repeated Exam.

Credits Registered	Credits Earned	Cumulative Credits Earned	$\Sigma(C_i X G_i)$	SGPA	CGPA
34	25	68	141	4.15	6.01

Medium of Instruction: English

Date: July 18, 2022

Rangaswamy B.E
Registrar (Evaluation)

Submitted : As per the result sheet the candidate has passed the subject 18CPC49 by secuing 29 Marks in Ext. Exam. This is not getting reflected in his Grade card # 262730. Kindly help.

Reg(Eval):

PRINCIPAL
RNS Institute of Technology
Channasandra, Bengaluru - 560 098
11/8

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

ವಿ.ತಾ.ವಿ ಸಾಮಯಿಕ ಫಲಿತಾಂಶ.
VTU PROVISIONAL RESULT.

ವಿ.ತಾ.ವಿ ಪದವಿ / ಸ್ನಾತಕೋತ್ತರ ಪದವಿ ಪರೀಕ್ಷೆಯ ಸಾಮಯಿಕ ಫಲಿತಾಂಶ ಜುಲೈ/ಆಗಸ್ಟ್-೨೦೨೧.
VTU PROVISIONAL RESULTS OF UG / PG JULY/AUGUST-2021 EXAMINATION.

University Seat Number	: 1RN18EC056
Student Name	: GAGANTEJ R T

Semester : 4

Subject Code	Subject Name	Internal Marks	External Marks	Total	Result
18MAT41	COMPLEX ANALYSIS, PROBABILITY & STAT. METHOD"	33	26	59	P
18EC42	ANALOG CIRCUITS	32	21	53	P
18EC43	CONTROL SYSTEMS	33	9	42	F
18EC46	MICROCONTROLLER	50	9	59	F
18ECL47	MICROCONTROLLER LABORATORY	49	25	74	P
18CPC49	CONST. OF INDIA, PROF. ETHICS & CYBER LAW	38	29	67	P

Semester : 3

Subject Code	Subject Name	Internal Marks	External Marks	Total	Result
18EC33	ELECTRONIC DEVICES	32	30	62	P
18EC34	DIGITAL SYSTEM DESIGN	30	15	45	F
18EC35	COMPUTER ORGANIZATION & ARCHITECTURE	20	21	41	P
18EC36	POWER ELECTRONICS & INSTRUMENTATION	19	21	40	P
18ECL37	ELECTRONIC DEVICES & INSTRUMENTATION LAB	21	42	63	P
18ECL38	DIGITAL SYSTEM DESIGN LABORATORY	20	26	46	P

Semester : 1

Subject Code	Subject Name	Internal Marks	External Marks	Total	Result
18CPS13	C PROGRAMMING FOR PROBLEM SOLVING	19	23	42	P

ನಾಮಕರಣ / ಸಂಕ್ಷೇಪಣಗಳು
Nomenclature / Abbreviations

P -> PASS	F -> FAIL	A -> ABSENT	W -> WITHHELD	X, NE -> NOT ELIGIBLE

Note :
1) Results of some subjects of some students are not appearing due to reasons such as,
a) CIE not Available
b) SEE not available
because of technical reasons etc, however they will be updated shortly.
2) Withheld results to be announced later

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru - 560 098

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Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098

RefNo.: RNSIT/2021…-20…22…/…25…/ **Date:** 02.07.2022

The Registrar (Evaluation)
Visvesvaraya Technological University
Belagavi-590 018

Sir,

Sub: Declaration of result of the candidate bearing USN: 1RN15EC071 in the sub:15ECS86 – reg.
Ref: 1. All our communication to VTU
1. His IA marks sent to VTU on 20/9/2021

We've been making repeated request for declaration of results of candidate bearing USN: 1RN15EC071.

Let me reiterate that we have submitted hardcopy of his IA marks on 20/9/2021, as we could not make in time submission of IA marks.

We request you to kindly not to treat this case as late submission of IA marks or IA marks submitted after the declaration of results.

This will be my last appeal to you to accept his IA marks sent on 20/9/2021 and declare his results.

Thanking you,

Yours sincerely,
Sd/-
(Dr. M K Venkatesha)
Principal

Submitted to Honorable Vice Chancellor for kind consideration.

MK Venkatesha 2/7/22

Dr. M K Venkatesha
Principal

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru-560 098

RNS INSTITUTE OF TECHNOLOGY

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for the *Academic Years 2018-19, 2019-20, 2020-21 and 2021-22*)
Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098

RefNo.: RNSIT/2021…-20…22…/…25…/ **Date:** 02.07.2022

The Registrar (Evaluation)
Visvesvaraya Technological University
Belagavi-590 018

Sir,

Sub: Declaration of result of the candidate bearing USN: 1RN15EC071 in the sub:15ECS86 – reg.
Ref: 1. All our communication to VTU
2. His IA marks sent to VTU on 20/9/2021

We've been making repeated request for declaration of results of candidate bearing USN: 1RN15EC071.

Let me reiterate that we have submitted hardcopy of his IA marks on 20/9/2021, as we could not make in time submission of IA marks.

We request you to kindly not to treat this case as late submission of IA marks or IA marks submitted after the declaration of results.

This will be my last appeal to you to accept his IA marks sent on 20/9/2021 and declare his results.

Thanking you,

Yours sincerely,

M K Venkatesha 2/7/22

Dr. M K Venkatesha
Principal

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru-560 098

RNS INSTITUTE OF TECHNOLOGY

(**AICTE** Approved, **VTU** Affiliated and **NAAC 'A'** Accredited)
(**UG programs** – CSE, ECE, ISE, EIE and EEE have been **Accredited** by **NBA** for the *Academic Years 2018-19, 2019-20, 2020-21 and 2021-22*)
Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098

RefNo.: RNSIT/2021.../2022.../23/ **Date:** 04.06.2022

The Registrar (Evaluation)
Visvesvaraya Technological University
Belagavi-590 018

Sir,

Sub: Declaration of result of the candidate bearing USN: 1RN15EC071 in the sub:15ECS86 – reg.
Ref: Your office letter No VTU/EXAM/2021-22/258 dt. 03.06.2022.

Thank you for your letter cited in reference. The said candidate took readmission to 7th sem during August 2019. The said candidate did not take up technical seminar during his regular VIII sem (during 2020) and ended up getting a '0'. He took the seminar in the next academic year 2021. He secured 65 marks out of 100. Detailed activities are as under:

Appeared for	**During**
For VII sem exams	Dec. 19/Jan 20 exam
Arrear subjects of VII sem and Regular sem of VIII sem (excluding 15ECS86)	Aug / Sep 20 exam
Arrears subjects of VI, VII and VIII sem	June/July 2021 exam

His USN was not getting reflected in the online IA marks submission portal; and as such we could not upload the marks in the sub 15ECS86 in online mode. Hence we have submitted the hardcopy of IA marks to VTU for further needful.

We request you kindly accept our clarification with regard to his IA marks and announce the result of the above student.

Inconvenience caused in this regard is highly regretted.

Thanking you,

Yours sincerely,

MK Venkatesha 4.6.2022

(Dr. M K Venkatesha)
Principal

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru-560 098

RNS INSTITUTE OF TECHNOLOGY

(**AICTE** Approved, **VTU** Affiliated and **NAAC 'A'** Accredited)
(**UG programs** – CSE, ECE, ISE, EIE and EEE have been **Accredited** by **NBA** for the *Academic Years 2018-19, 2019-20, 2020-21and 2021-22*)
Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098

The Registrar (Evaluation)
Visvesvaraya Technological University
Belagavi-590 018

03.06.2022

Sir,

Sub: Declaration of pending results of the candidate bearing **USN: 1RN18ED118** and **1RN15EC071** - reg

Kindly recall the discussions had with you on 31.5.2022 regarding the subject cited in reference.

While thanking you for your patient listening we would request you to accept our justification and arrange to declare results of candidates with details as under:

Sl. No.	USN	Subject in which results are pending
1	1RN18EC118	18CV59
2	1RN15EC071	15ECS86

Thanking you in anticipation of favorable response.

Yours sincerely,

MK Venkatesha 03.06.2022

(Dr. M K Venkatesha)
Principal

PRINCIPAL
RNS Institute of Technology
Channasandra, Bengaluru-560 098

RNS INSTITUTE OF TECHNOLOGY

(AICTE Approved, VTU Affiliated and NAAC 'A' Accredited)
(UG programs – CSE, ECE, ISE, EIE and EEE have been Accredited by NBA for the Academic Years 2018-19, 2019-20 , 2020-21 and 2021-22)
Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098

13/5/2022

To,

The Principal
RNS Institute of technology, Bangalore-98.

Through,

The HOD
Dept. Of Electrical and Electronics Engineering
RNS Institute of technology, Bangalore-98.

Respected Sir/Madam,

Sub: Regarding discrepancy in III semester VTU question paper Electric Circuit Analysis (18EE32) question paper.

With reference to above subject, we have notified the following discrepancy in VTU III semester Electrical and Electronics Engineering exam question paper held on 13/5/2022 (Morning session).

Subject Name: Electric Circuit analysis, Subject Code:18EE32.

Question No.	Discrepancy
2.b	Current I_y is not indicated in the circuit shown in fig.Q2(b)
3.b	Current I_0 is not indicated in the circuit shown in fig.Q3(b). The corrected copy was received at 12.25PM and many students had left the exam hall by then.
7.b.	Out of syllabus as per 2018 scheme and it carries 10 marks (syllabus copy enclosed).
8.c	Out of syllabus as per 2018 scheme and it carries 6 marks (syllabus copy enclosed).
9.c	Dependent voltage source ($3V_1$) is given in the circuit shown in fig.Q9(c) and terminal voltages (V_1) are mentioned on both sides of circuit.

As the following discrepancy will impact the performance of the students, we request you to take necessary actions. The question paper copy is enclosed for reference.Kindly oblige.

Thanking You,

Vijayshree-h.
Mrs. Vijayshree G
Asst.Prof.

Forwarded
Mrk

MK Chandrashekar
13.5.22

Submitted/Reg (ERP):

PRINCIPAL
RNS Institute of Technology
Channasandra, Bengaluru-560 098

Sub: 18EE32

Q2 b. Using Mesh analysis, find the current through 10Ω resistor in the circuit shown in Fig. Q2(b). **(06 Marks)**

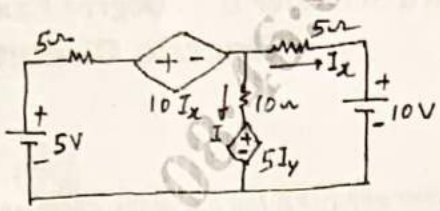


Fig. Q2(b)

I_y is not specified

Q3 b. Find the Thevenin and Norton equivalent circuit at terminals AB for the circuit shown in Fig. Q3(b). **(10 Marks)**

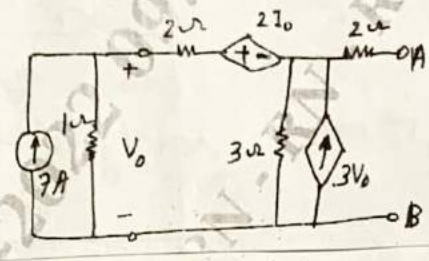


Fig. Q3(b)

I_0 ?

Q7 b. In the circuit shown in Fig. Q7(b), the switch is opened at t = 0, with V = 1V , C = 1F , L = $\frac{1}{2}$H and G = 1℧. Find the node voltages $V_1(t)$ and $V_2(t)$ by Laplace transform method. **(10 Marks)**

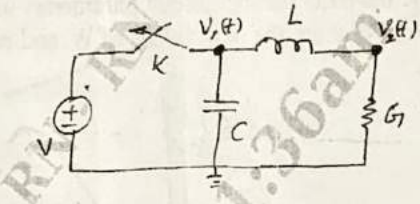


Fig. Q7(b)

Not in Syllabus as per 18scheme

Q8 c. In the circuit shown in Fig.Q8(c), the switch is closed at t = 0 and there is no initial charge on either of the capacitors. Find the resulting current 'i'. Using Laplace transformation. **(06 Marks)**

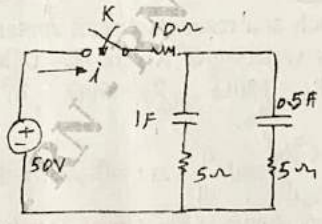
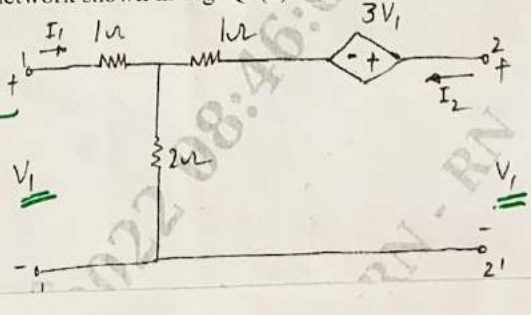


Fig. Q8(c)

Not in Syllabus as per 18 scheme

Q9c c. Determine [Z] for the network shown in Fig. Q9(c). **(04 Marks)**



V_1 appears twice

Fig. Q9(c)

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

ELECTRIC CIRCUIT ANALYSIS

Course Code	18EE32	CIE Marks	40
Teaching Hours/Week (L: T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives:

- To familiarize the basic laws, source transformations, theorems and the methods of analyzing electrical circuits.
- To explain the use of network theorems and the concept of resonance.
- To familiarize the analysis of three-phase circuits, two port networks and networks with non-sinusoidal inputs.
- To explain the importance of initial conditions, their evaluation and transient analysis of R-L and R-C circuits.
- To impart basic knowledge on network analysis using Laplace transforms. ■

Module-1

Basic Concepts: Active and passive elements, Concept of ideal and practical sources. Source transformation and Source shifting, Concept of Super-Mesh and Super node analysis. Analysis of networks by (i) Network reduction method including star – delta transformation, (ii) Mesh and Node voltage methods for ac and DC circuits with independent and dependent sources. Duality. ■

Module-2

Network Theorems: Super Position theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem and Millman's theorem. Analysis of networks, with and without dependent ac and DC sources. ■

Module-3

Resonant Circuits: Analysis of simple series RLC and parallel RLC circuits under resonances. Problems on Resonant frequency, Bandwidth and Quality factor at resonance

Transient Analysis: Transient analysis of RL and RC circuits under DC excitations: Behavior of circuit elements under switching action ($t = 0$ and $t = \infty$), Evaluation of initial conditions. ■

Module-4

Laplace Transformation: Laplace transformation (LT), LT of Impulse, Step, Ramp, Sinusoidal signals and shifted functions. Waveform synthesis. Initial and Final value theorems. ■

Module-5

Unbalanced Three Phase Systems: Analysis of three phase systems, calculation of real and reactive Powers by direct application of mesh and nodal analysis.

Two Port networks: Definition, Open circuit impedance, Short circuit admittance and Transmission parameters and their evaluation for simple circuits, relationships between parameter sets. ■

Course Outcomes: At the end of the course the student will be able to:

- Understand the basic concepts, basic laws and methods of analysis of DC and AC networks and reduce the complexity of network using source shifting, source transformation and network reduction using transformations.
- Solve complex electric circuits using network theorems.
- Discuss resonance in series and parallel circuits and also the importance of initial conditions and their evaluation.
- Synthesize typical waveforms using Laplace transformation.
- Solve unbalanced three phase systems and also evaluate the performance of two port networks. ■

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module. ■

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				

nk Chen/Gokhale
13.5

Regulation & Deviance 28/4/21

Visvesvaraya Technological University

"Jnana Sangama", Belagavi - 590 018, Karnataka State

From,

Dr. M K Venkatesha
Chairman, ECE/TCE BoS, VTU, Belgaum
Principal, RNS Institute of Technology

To,

The Registrar
VTU, Belagavi – 590 018

Sub: For the **NEP ECE Syllabus** "how much of importance is given to semiconductors/VLSI, for Deep Learning and MSME.,

In the current NEP syllabus, the basic VLSI subject 'VLSI Design & Testing' and associated lab – 'VLSI Laboratory', which was in 7th semester previously is brought to 6th semester, so that the students can prepare well and do better in their placements. Also, extra advanced subjects in semiconductors/VLSI are added as Professional electives to increase the thrust in this area as elaborated in table below.

(Note: L – T – P ➔ Lecture – Tutorial – Practical Hours allocated to the corresponding subject.)

Table: Subjects in semiconductors/VLSI

Semester / Credits	Code	Subject	L – T – P	Remarks
Third sem / 4 Credits	IPCC 21EC32	Digital System Design using Verilog	3 – 0 – 2	**Professional Core subject with integrated lab** introduced at lower semester. Digital circuits modelling and testing with Verilog HDL (Hardware Description Language) is introduced in third semester itself along with Logic design to incorporate the basics.
Sixth sem / 3 Credits	PCC 21EC63	VLSI Design & Testing	3 – 0 – 0	The basic Design and testing circuit is brought to sixth semester (from 7th sem position in previous syllabus) to enable students to successfully take up placements and internships.
Sixth sem / 1 Credits	PCC 21ECL66	VLSI Laboratory	0 – 0 – 2	Associated lab to provide a hands-on experience, also introduced at a lower semester.
Seventh sem / 3 Credits	PCC 21EC71	**Advanced VLSI**	3 – 0 – 0	Added **newly in the current NEP syllabus**, this subject covers the ASIC Design for mixed mode VLSI concepts and the System Verilog testing concepts which is very much needed in the current industry.
Seventh sem / 3 Credits	21EC721	**Advanced Design Tools for VLSI**	2 – 0 – 2	**Designed** and **added for the first time** as a Professional Elective – II, for providing a hands-on knowledge of the latest tools in VLSI Design.
Sixth sem /3 Credits	21EC644	Micro Electro Mechanical Systems	3 – 0 – 0	Professional Elective – I to provide an overview of MEMS Design and fabrication.
Sixth sem /3 Credits	21EC653	**Basic VLSI Design**	3 – 0 – 0	**Open Electives – I**
Sixth sem /3 Credits	21EC654	**Electronic Circuits with Verilog**	2 – 0 – 2	**Open Electives – I**

Conventional / basic semiconductor theory and lab subjects **retained & enhanced** in the new NEP syllabus are listed below.

Semester / Credits	Code	Subject	L – T – P	Remarks
Third sem / 3 Credits	PCC 21EC34	Analog Electronics Circuits	3 – 0 – 0	Basic subject retained as Professional core subject
Third sem / 1 Credits	PCC 21ECL35	Analog & Digital Electronics Lab	0 – 0 – 2	Associated lab for hands-on training
Fourth Sem / 4 Credits	IPCC 21EC43	Circuits & Controls	3 – 0 – 2	Basic subjects retained as Professional core subject with integrated lab
Sixth sem / 4 Credits	IPCC 21EC62	Computer Organization & ARM Microcontrollers	3 – 0 – 2	Introduced newly with ARM thrust in integrated mode.
Sixth sem / 3 Credits	21EC652	Microcontrollers	3 – 0 – 0	Open Electives – I
Seventh sem / 3 Credits	21EC742	ARM Embedded Systems	3 – 0 – 0	Open Electives – I

Ability Enhancement Courses Introduced in NEP to enhance skill development in semiconductors / VLSI Domains				
Sl. No.	**Code**	**Subject**	**L – T – P**	**Remarks**
1	21EC581	Nanoelectronics	1 – 0 – 0	Introduced Newly
2	21EC381	LD Lab using Pspice / MultiSIM	0 – 0 – 2	Introduced Newly
3	21EC382	AEC Lab using Pspice / MultiSIM	0 – 0 – 2	Introduced Newly
4	21EC383	LIC Lab using Pspice / MultiSIM	0 – 0 – 2	Introduced Newly
5	21EC384	LabVIEW Programming Basics	0 – 0 – 2	Introduced Newly
6	21EC481	Embedded C Basics	1 – 0 – 0	Introduced Newly
7	21EC482	C++ Basics	1 – 0 – 0	Introduced Newly

The new NEP syllabus from ECE/TCE board has included the following subjects to give importance in the areas of **'Deep Learning' and 'MSME'**.

Semester / Credits	Code	Subject	L – T – P	Remarks
Deep Learning Subjects				
Sixth sem / 3 Credits	21EC641	Artificial Neural Networks	2 – 2 – 0	Professional Elective – I
Seventh sem / 3 Credits	21EC734	Machine Learning with Python	2 – 0 – 2	Professional Elective – III
Pre-requisite subjects to implement Deep Learning				
Fifth Sem / 4 Credits	IPCC 21EC52	Object Oriented Programming with Java & Data Structures	3 – 0 – 2	Java - Core programming language (OOP oriented) and associated data structures concepts with hands on lab introduced as a core subject for the first time to EC/TC students to implement the Deep learning algorithms.
Sixth sem / 3 Credits	21EC643	Python Programming	2 – 0 – 2	Latest and most pervasive programming subject introduced as a Professional elective at a lower semester to enable deep learning/ ANN projects & internships.

MSME Subjects				
Semester / Credits	**Code**	**Subject**	**L – T – P**	**Remarks**
Sixth sem / 3 Credits	HSMC 21EC61	Technological Innovation Management and Entrepreneurship	3 – 0 – 0	**Existing** management and Entrepreneurship syllabus **retained** for MSME.
Seventh sem / 3 Credits	21EC733	**Fabrication technology**	3 – 0 – 0	**Introduced newly** as Professional Elective – III
Seventh sem / 3 Credits	21EC745	**E-waste Management**	3 – 0 – 0	Management subject **Introduced newly** as Open Electives – II
Sixth sem / 3 Credits	21EC644	Micro Electro Mechanical Systems	3 – 0 – 0	Professional Elective – I
Sixth sem / 3 Credits	21EC655	Sensors & Actuators	3 – 0 – 0	Open Electives – I
Fourth sem / 1 Credit	21EC484	DAQ using LabVIEW	0 – 0 – 2	**Introduced newly** as Ability Enhancement Subject for data acquisition to enable automated testing and calibration in manufacturing industry.

Regards,

Yours faithfully,

M K Venkatesha
28.4.22

Dr. M K Venkatesha
Chairman, ECE/TCE BoS, VTU, Belgaum
Principal, RNS Institute of Technology
Channasandra, Rajarajeshwari Post, Bengaluru – 560 098

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru-560 098

VTU/BGM/BOS/SO2/2021-22/245

27-04-2022

To,
The Principal,
RNSIT,
Bangalore. (Halbari)

dt 13.4.2022

From,
EVN Subject Teachers,
Department of Mechanical Engineering,
RNSIT,
Bangalore.

Respected Sir,

Sub: Corrections in EVN Question bank – Reg.

With respect to the above mentioned subject, we had received a draft copy of the question bank for the 1st year Engineering subject titled **Engineering Visualization-21EVN15/25** dated 13th April 2022. The question bank was discussed by the faculties currently handling the above said subject and observed few corrections to be implemented. The corrections are enlisted below. We humbly request to bring it to the notice of the concerned authorities.

Kindly do the needful and oblige.

Thanking you,

Yours Sincerely

Harikrishna Patel. 27.4.22

Rakshith A N.

(N.S. Rayalwar)

(Manjunath)

(SRIDHAR. M. Shastry)

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru-560 098

Proposed Corrections ✓ Suggested / Proposed by our team

MK Chandrasekaran 28/4

MODULE 01

iii) Projection of Planes

1. ABC is an equilateral triangle of xxxx mm side. The corner A is in HP and B is on VP. Surface is inclined at 60^0 to HP and edge BC is inclined at 30^0 to VP. Draw the top view and front view of the triangle.

7. An equilateral triangle thin plate PQR of xxxx mm side lies on one of its side in VP. Draw the projections of the plate when the plate surface is inclined at xxxx° to the VP. One of the sides of the triangular plate is inclined at XXXX° to the HP.

8. A circular lamina appears as an ellipse of xxxx mm major axis and xxxx mm minor axis in the front view. Draw the projections when major axis is parallel to both VP and HP and one end of minor axis touching both HP and VP.

9. Draw the projection of an A4 size paper resting on one of its shorter edge on table and is inclined at xxxx degrees to table and on one of its shorter edge is inclined to wall at xxxx degrees, assuming thickness as zero.

MODULE 02

1. A square pyramid, edge of the base xxxx mm and height xxxx mm, rests on its base on HP, such that base edge equally inclined to VP. Draw the projections of the square pyramid when axis inclined at 40° to HP and 30° to VP.

4. A right circular cone, diameter of the base xxxx mm and height xxxx mm, lies on HP on one of its point on circumfrence such that its axis is inclined to VP at xxxx degrees. Draw its projections when the axis is inclined to HP xxxx degrees.

5. A Pentagonal pyramid, edge of base xxxx mm and height xxxx mm, lies on HP on one of its slant edge. Draw its projections when the axis appears to be inclined at xxxx degrees to VP.

Sent by VTU

MODULE 01

iii) Projection of Planes

1. ABC is an equilateral triangle of xxxx mm side. The end A is in HP and B in VP. **Side AB is inclined at XXXX° to HP** and XXXX° to VP. **Side BC is inclined at XXXX° to HP**. Draw the front and top views of the triangle and find the inclination of side AC with HP (cannot be satisfied).

7. An equilateral triangle thin plate PQR of xxxx mm side lies on one of its side in VP. Draw the projections of the plate when the plate surface is **vertical** and inclined at xxxx° to the VP. One of the sides of the triangular plate is inclined at XXXX° to the HP (the word VERTICAL to be removed).

8. A circular lamina of xxxx mm **radius** appears as an ellipse of xxxx mm major axis and xxxx mm minor axis in the **view from above**. Draw the projections (incomplete as inclination to VP and radius need not be given).

9. Draw the projection of an A4 size paper resting on the table at **xxxx degrees** on one of its **shorter edge** assuming thickness as zero (incomplete).

MODULE 02

1. A square pyramid, edge of the base xxxx mm and height xxxx mm, rests on its base on HP, with its base edge equally inclined to VP. **Draw the three views of the square pyramid** (inclination to HP/VP is not given).

4. A right circular cone, diameter of the base xxxx mm and height xxxx mm, lies on HP on one of its edge such that its axis is parallel to VP. Draw its projections by using **both the methods** (inclination to HP is not given).

5. A Pentagonal pyramid, edge of base xxxx mm and height xxxx mm, lies on HP on one of its slant edge and has its axis parallel to VP. Draw its projections by **using both the methods** (inclination to VP is not given).

RNS INSTITUTE OF TECHNOLOGY

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(**UG programs** – CSE, ECE, ISE, EIE and EEE have been **Accredited** by **NBA** for the *Academic Years 2018-19, 2019-20, 2020-21and 2021-22*)
Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098

The Registrar (Evaluation)
Visvesvaraya Technological University
Belagavi-590 018

14
~~01~~.03.2022

Sir,

It has been brought to our notice today that the candidate bearing USN: 1RN18EC421 has not yet cleared the subject 17CIV18/28. We've herewith enclosed a letter from the candidate for appearing in the said subject during Jan/Feb 2022 exam. This kind act of yours will enable the candidate to register for the same and appear for exam.

Thanking you,

Yours sincerely,

M K Venkatesha

(Dr. M K Venkatesha) 14.3.22
Principal

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru-560 098

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Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098

The Registrar (Evaluation)
Visvesvaraya Technological University
Belagavi-590 018

23.02.2022

Sir,

Sub: Out of syllabus questions that appeared in Sub Code: 18MCA552

This refers to out of syllabus questions that appeared in 18MCA552.

Questions 3 a, 5 b, 6 a, 6 b, 9 b and 10 a of 18 MCA 552 are from out of syllabus (Prescribed Text : Ben Shneiderman, Plaisant, Cohen, Jacobs: Designing the user Interface, **5th Edition,** Pearson Education, 2010).

We request you to kindly look into the matter & do the needful.

Thanking you,

Yours sincerely,

MK Venkatesha 23.02.22

(Dr. M K Venkatesha)
PRINCIPAL

PRINCIPAL
R N S Institute of Technology
Channasandra, Bengaluru-560 098

Sub code: 18 MCA 552

Question paper pattern:

- The question paper will have ten questions.
- Each full question will be for 20 marks
- There will be 2full questions (with a maximum of four sub questions) from each Module.
- Each full question will have sub questions covering all the topics under a Module.
- The students will have to answer 5 full questions, selecting one full question from each Module.

Textbooks:

1. Ben Shneiderman, Plaisant, Cohen, Jacobs: Designing the User Interface, 5th Edition, Pearson ,Education, 2010

Reference Books:

1. Alan Dix, Janet Finalay, Gregory D AbiwdmRussel Bealel: Human-Computer Interaction, III Edition, Pearson ,Education, 2008.
2. Eberts: User Interface Design, Prentice Hall, 1994
3. Wilber O Galitz: The Essential Guide to User Interface Design- An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt Ltd, 2011

PRINCIPAL
RNS Institute of Technology
Channasandra, Bengaluru-560 098

From
Manikanta.L
1RN15EC071
RNSIT, ECE
Chitradurga.

TO
PRINCIPAL
RNSIT
Bangalore

TOpic:- "Requesting to give Extra time to write exams due to Disability"

Sir I'm Manikanta.L Four year BE Completed but still i have backlogs I'm suffering from "Mixed OCD" kind of "Mentall illness" and also i have disability Certificate to this, I need extra time to write exams so plz give me extra time to write exam,

~~yours faithfully~~

Your faithfully
Manikanta.L

Forwarded to the RE(A&EV), VTU for needful.

Date:- 14/2/22
Day:- Monday

PRINCIPAL
RNS Institute of Technology
Channasandra, Bangalore-560 098

Mobile:- 9902017724

Department of Empowerment of Persons with Disabilities,
Ministry of Social Justice and Empowerment, Government of India

Disability Certificate

Issuing Medical Authority, Chitradurga, Karnataka



Date: 13/08/2021

Certificate No.: KA1260819970191423

This is to certify that I/we have carefully examined Shri **Manikanta L**, Son of Shri **Lakshmana V**, Date of Birth **21/03/1997**, Age **24**, Male, Registration No. **2912/00000/2105/0149069**, resident of House No. **Bommenahalli, Chitradurga Taluk And District Karna - 577520**, Sub District **Chitradurga** , District **Chitradurga**, State / UT **Karnataka**, whose photograph is affixed above, and I am/we are satisfied that:

(A) He is a case of **Mental Illness**
(B) The diagnosis in his case is **Mixed OCD with Psychotic Symptoms.**
(C) He has **50%**(in figure) **Fifty** percent(in words) Temporary Disability in relation to his Brain as per the guidelines (Guidelines for the purpose of assessing the extent of specified disability in a person included under RPwD Act, 2016 notified by Government of India vide S.O. 76(E) dated 04/01/2018).

This certificate recommended for **4 year(s) 11 month(s)**, and therefore this certificate shall be valid till **13/07/2026**

The applicant has submitted the following document(s) as proof of residence:

Nature of Document(s): Aadhaar card

Signature / Thumb Impression of the Person with Disability

Signatory of notified Medical Authority Member(s)

Issuing Medical Authority, Chitradurga, Karnataka

This Card/Certificate is meant to certify the disability of the person and is not an instrument for ID/Address Proof for any purpose.

UNIQUE DISABILITY ID

Government of India

STATE ID:
N/A

Aadhaar No.
**********6335**

Address of the Card Issuing Authority State/District level
District Hospital Chitradurga Bd Road, Chitradurga, Karnataka - 577501

UNIQUE DISABILITY ID

Government of India

नाम / Name
ಮಣಿಕಂಠ ಎಲ್
Manikanta L



UD ID
KA1260819970191423

Disability Type
Mental Illness

Year of Birth	% of Disability
1997	**50% (Fifty Percent)**

Date of Issue	Valid upto
13/08/2021	**13/07/2026**

Issuing Authority Sign

USN | 1 | R | N | | | C | S | | | |

RNS Institute of Technology

Department of CSE

III Semester - I Test – November 2021

Computer Organization (18CS34)

Duration: 90 mins. **Max Marks: 50** **Time: 2:00-03:40 pm** **Date: 30/11/21**

NOTE: Answer *FIVE* full questions.

Don't write anything on question paper other than USN.

Qn. No.		Questions	Marks	BCL	CO
1	a)	Define clock cycle.	2	L1	
	b)	List the special registers involved in fetching the instruction and data from memory. Mention their functions along with a suitable block diagram.	2+6	L2	CO1
		OR			
2	a)	Write the basic performance equation? Discuss the role of parameters on the performance of the computer.	1+3	L1	CO1
	b)	With an example explain safe push and safe pop operations on the stack.	3+3	L3	CO1
3	a)	Define byte addressability? Explain 2ways that byte addresses are assigned across words.	2+4	L1	CO1
	b)	Give a short sequence of machine instructions for the task " Add the contents of memory location A to those of location B, and place the answer in location C." (Note: Load and Store are the only instructions available to transfer data between the memory and registers)	2	L4	CO1
	c)	Consider a computer that has a byte-addressable memory organized in 32-bit words according to the little-endian scheme. A program reads ASCII characters entered at a keyboard and stores them in successive byte locations, starting at location 1000. Show the contents of the memory words after the name "bengaluru" has been entered.	2	L3	CO1
		OR			
4	a)	Consider the below machine instructions: i) AND #20,R2 ii) MOVE 30(R1), R2 How many bits are needed to store the above instructions?	4	L4	CO1
	b)	Show how the operation C=A+B can be implemented in a single accumulator computer by i) 3-address instruction ii) 2-address instruction iii) 1-address instruction	1+2+3	L3	CO1
5	a)	Discuss any 4 commonly used conditional code flags.	4	L1	CO1
	b)	Write an assembly code to add N numbers in the list using subroutine. Show the contents of stack at different levels.	3+3	L3	CO1
		OR			
6	a)	Define addressing mode.	2	L1	CO1
	b)	Illustrate the below addressing modes with suitable example i) Indirect ii) index iii) auto increment iv) relative	8	L3	CO1

Bloom's Cognitive Levels (BCL): L1: Remember, L2: Understand, L3: Apply, L4: Analyze, L5: Evaluate, L6: Create

VISION: Preparing better computer professionals for a real world

7	a)	Write an assembly program to read a line of characters until carriage return key is pressed. Explain each statement in the program.	6	L3	CO1
	b)	Discuss the usage of Link register in subroutine execution.	4	L1	CO2
		OR			
8	a)	Perform the following operation on the data in register R0 - 011001100....00110 i) RotateR #2, R0 ii) RotateL #3, R0 iii) RotateRC #2, R0 iv) RotateLC #3, R0 v) LshiftR #2, R0	10	L3	CO2
9	a)	Write an Assembly language instruction to find whether first Byte contains the character "Z" along with the memory representation for each Instruction.	4	L2	CO2
	b)	Write an assembly program to add N-numbers using indirect addressing mode.	6	L2	CO2
		OR			
10	a)	Discuss the status and control registers used in Keyboard and display interface with suitable diagram.	6	L2	CO3
	b)	Write a short note on interrupts.	4	L1	CO3

Course Outcomes (CO):

CO1 - Visualize the basic building blocks of the computer.
CO2- Analyze the programs as a sequence of machine instructions.
CO3 - Explore different ways of communicating with I/O devices and interfaces.

RNS Institute of Technology
Department of CSE
III Semester - Quiz – NOVEMBER 2021
Computer Organization (18CS34)

Duration: 10 mins. **Max.Marks: 10** **Date: 30/11/21**

NOTE: Answer all questions.
Don't write anything on question paper other than USN.

Q.No.	Questions	Marks
1	In one address instructions, ---------- register is used as implicit register. a) General purpose b) accumulator c) special d) MAR	1
2	How many bits are required to represent an opcode in an architecture having 256 types of instructions?	1
3	Move (SP)+, ITEM instruction is used in stack to ---------- an element. a) Display b) push c) pop d) traverse	1
4	Load instruction is used to fetch the instruction/data from memory. (True/False)	1
5	Relative addressing mode uses the content of ---------- register to find the effective address. a) Base b)index c) program counter d) status	1
6	_____ will be value of SIN bit when there is data in DATAIN register.	1
7	The register used to save return addresses is _____ a) MAR b) MDR c) Link d) PC	1
8	The keyboard status flag is ---------- and display status flag is -------- a) SIN, SOUT b) SOUT, SIN c) DATAIN, SIN d) DATAOUT, SOUT	1
9	The routine executed in response to an interrupt request is called as ------ a) Function b) subroutine c) ISR d) recursion	1
10	When the I/O devices and the memory share the common address space, the arrangement is called as ---------- a) I/O mapped I/O b) memory mapped I/O c) interrupt controlled I/O d)none	1

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MG

1	R	N								

RNS INSTITUTE OF TECHNOLOGY

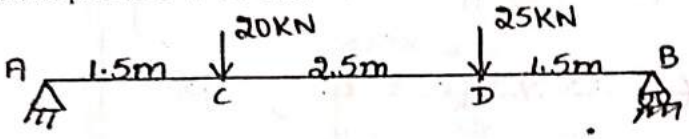
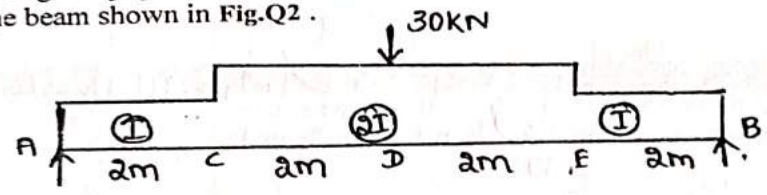
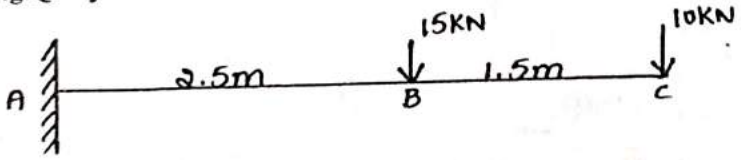
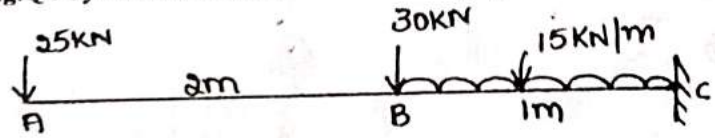
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(UG programs – CSE, ECE, ISE, EIE and BIE have been Accredited by NBA
for the Academic Years 2018-19, 2019-20 ,2020-21 and 2021-2022)
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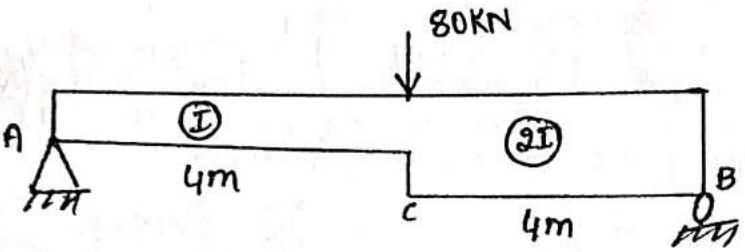
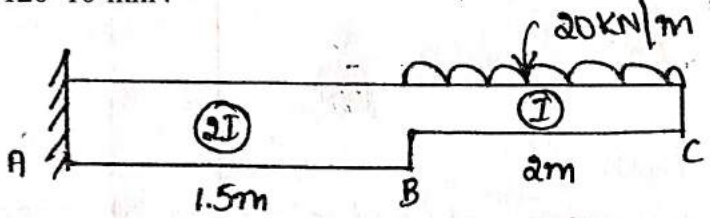
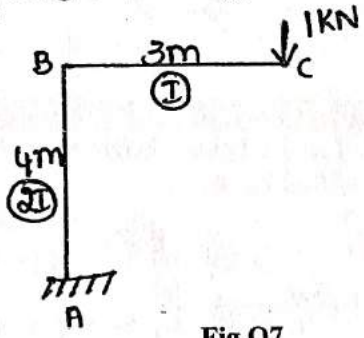
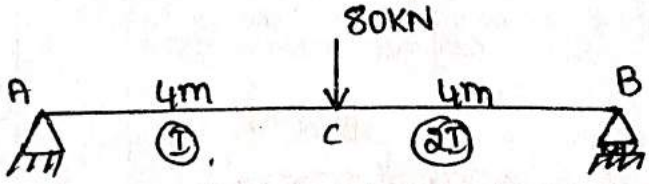
Department: CIVIL ENGINEERING

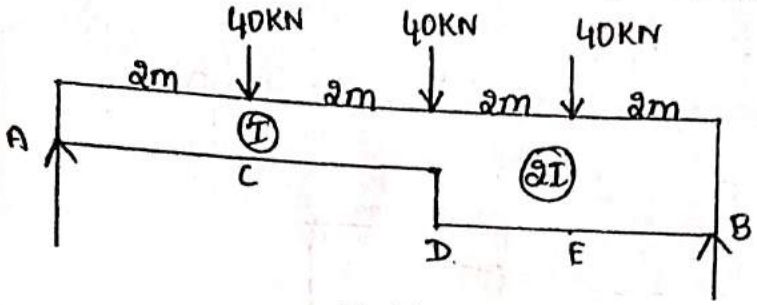
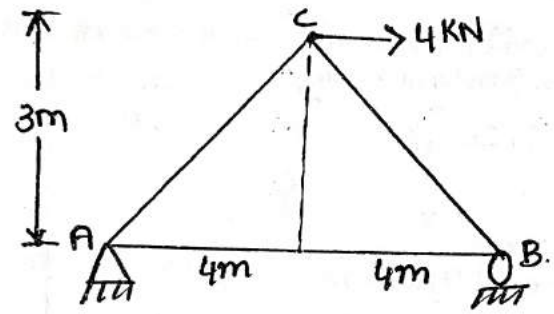
I-INTERNAL TEST

SEM: IV - SEMESTER BE (CBCS) | Date: 28-06-2022
SUB: ANALYSIS OF DETERMINATE STRUCTURES | Time :9.00-10.40 AM
SUB CODE: 18CV42 | Max. Marks: 50

Instructions: Answer **any five questions** as per **INTERNAL CHOICE.**

	Question	Marks	Bloom's Cognitive level	CO'S
1	For the beam shown in **Fig.Q1**,compute the rotations at supports and also find maximum deflection by moment area method. Take E=200Gpa and I=$4*10^8$ mm^4  **Fig.Q1**	14	L4,L5	CO3
	OR			
2	Using conjugate beam method find the mid span deflection of the beam shown in **Fig.Q2** .  **Fig.Q2**	14	L4,L5	CO3
3	Determine maximum slope and deflection for the beam shown in Fig.Q3 by moment area method. Take EI=8000 kN-m^2  **Fig.Q3**	8	L4,L5	CO3
	OR			
4	Compute the deflection at the free end of cantilever beam shown in Fig.Q4 by moment area method *or conjugate beam method.*  **Fig.Q4**	8	L4,L5	CO3

5	Calculate slope at support and deflection under the point load the beam shown in Fig.Q5 using moment area method.  Fig.Q5	8	L4,L5	CO3
	OR			
6	Calculate slope at 'B' and deflection at 'C' for the beam shown in Fig.Q6 using Conjugate beam method. Take E=210Gpa $I=120*10^6mm4$  Fig.Q6	8	L4,L5	CO3
7	Determine the vertical deflection of point 'C' in the frame shown in the Fig.Q7 using Strain energy method. Take E=200 kN/mm^2 $I=30*10^6mm^4$  Fig.Q7	8	L4,L5	CO4
	OR			
8	Determine the deflection at the load point for the beam shown in Fig.Q8 by using strain energy method.  Fig.Q8	8	L4,L5	CO4

9	Determine the vertical deflection of the beam shown in **Fig.Q9** at point 'D'. Take $E=2*10^5$ kN-m^2. Use Castigliano's first theorem.  **Fig.Q9**	12	L4,L5	CO4
	OR			
10	Determine the horizontal displacement of joint C of the truss shown in **Fig.Q10**. The C/S area of each member of the truss is A=400mm^2 and E=200GPa. Use Castigliano's theorem.  **Fig.Q10**	12	L4,L5	CO4

Blooms Cognitive Level: L1=Remember, L2=Understand, L3=Apply, L4= Analyse, L5= Evaluate, L6= Create

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I – INTERNAL TEST

SEM: **VI (A, B, C, D)** Date: 9-5-22
Subject: **Digital Communication** Time: 9am-10.30am
Sub. Code: **18EC61** Max. Marks: **50**

Note: Answer any five full questions

Q. No.		Questions	M	COs	BCL*
1	a	Define Hilbert transform with relevant expression. State its properties.	4	CO1	L1
	b	Find the Hilbert Transform of $x(t) = \sin t / t$.	6		L2
		OR			
2	a	Find the g_+ and g_- pre-envelope for lowpass signal g(t).	7	CO1	L1
	b	Sketch the amplitude spectra of complex envelope of a bandpass signal S(t).	3		L3
3	a	Obtain the Canonical representation of band – pass signal and draw the schematic block diagrams for deriving the in – phase & quadrature components of a band – pass signal followed by its reconstruction using the same components.	8	CO1	L1
	b	Obtain the Polar representation of band – pass signal.	2		L2
		OR			
4	a	Show that $H\tilde{}(f-f_c) = 2H(f)$ for a bandpass system impulse response h(t) with Fourier transform H(f).	5	CO1	L2
	b	What are line codes? List the properties of Line Codes. Also list some applications.	5		L2
5	a	Derive the equation for Power Spectral Density (PSD) of NRZ polar signaling format and draw its normalized PSD.	5	CO1	L3
	b	For a given binary sequence **0 1 0 1 1 0 1 1**, draw the following digital signaling formats. (i) Polar NRZ (ii) Bipolar RZ (iii) Polar RZ (iv) Bipolar NRZ (v) Manchester Code.	5		L1
		OR			
6	a	Give the comparison of line codes by considering PSD analysis.	4	CO1	L2
	b	For the binary data sequence **1 0 1 0 0 0 0 1 1 0 0 0 0 0 0 0 1 1 0 0 0** given. sketch the encoded signal for following coding techniques, assuming first nonzero pulse is positive. (a)B6ZS (b) HDB3 (c)B3ZS	6		L2
7	a	Explain Gram – Schmidt orthogonalization procedure.	5	CO2	L2
	b	Using the Gram – Schmidt orthogonalization procedure, find a set of orthonormal basis functions for the signals $s_1(t)$, $s_2(t)$ *and* $s_3(t)$. sketch the resulting orthonormal basis functions.	5		L3

		OR			
8	**a**	Explain the geometric representation of set of M energy signals as linear combination of N orthonormal basis function. Illustrate for the case N=2 and M=3 with necessary diagram and expressions.	**5**	CO 2	L 2
	b	Show that energy of a signal is a squared length of corresponding signal Vector.	**5**		L 3

9	**a**	Using the Gram – Schmidt orthogonalization procedure, find a set of orthonormal basis functions to represent the four signals $s_1(t)$, $s_2(t), and\ s_4(t)$.And sketch the resulting orthonormal basis functions.	**7**	CO 2	L 3
	b	For the above problem 9a , express each signals $s_1(t)$, $s_2(t), and\ s_4(t)$ in terms of basis functions, Also draw the constellation diagram	**3**		L 3
		OR			
10	**a**	Obtain the Power Spectral Density (PSD) of NRZ bipolar format and draw its normalized PSD.	**7**	CO 1	L 3
	b	Explain the following with respect to geometric representation i) Length of a vector (ii) Angle between two vectors (iii) Euclidian distance.	**3**		L 3

*Bloom's Cognitive Levels: L1 – Remember, L2 – Understand, L3 – Apply, L4 – Analyze, L5 – Evaluate, L6– Create.

CO1: Analyze baseband and bandpass signals in time and frequency domain.

CO2: Prepare mathematical background for digital communication signals and systems

Quiz: Each question 1 mark (answer all questions)

1. The information content of a modulated signal (t) is fully preserved in the complex envelope $\tilde{s}(t)$. Is this statement ----------True / False

2. In the relation, $x(t) = X_i(t)\cos 2\pi fct - X_q(t)\sin 2\pi fct$ the low frequency components $X_i(t)$ and $X_q(t)$ are called _____ of the bandpass signal x(t).

a) Inphase and quadratic components b) Inphase and quadrature components

c) Triplet components d) None of the mentioned

3. what is the possible representation of x(t) if $x(t) = m(t)e^{j\,\theta(t)}$

a) $x(t) = m(t)\ cos(2\pi fc\ t - \theta(t))$ b) $x(t) = m(t)\ cos(2\pi fc\ t + \theta(t))$

c) $x(t) = m(t)\ \sin(2\pi fc\ t - \theta(t))$ d) $x(t) = m(t)\ \sin(2\pi fc\ t + \theta(t))$

4. Which of the following is true regarding the frequency response of Hilbert transform?

a) Complex b) Purely imaginary c) Purely real d) Zero

5. How much phase shift does an Hilbert transformer impart on the input?

a) 45° b) 90° c) 135° d) 180°

6. which of the code requires higher bandwidth

a) NRZ bipolar b) NRZ polar c) Manchester d) NRZ unipolar

7. In which of the following fields, Hilbert transformers are frequently used?

a) Generation of SSB signals b) Radar signal processing

c) Speech signal processing d) All of the mentioned

8. The Hilbert Transform transforms the time domain signal into

a) Time domain b)Frequency domain c)Both time domain and Frequency domain

d)Time domain or Frequency domain

9.The center frequency of complex envelope signal is_____

10. The impulse response of Hilbert transform is _____

QP SETTER **QP REVIEWER** **HOD**

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II – INTERNAL TEST

SEM: **VI (A, B, C, D)** Date: 09-06-2022
Subject: **Digital Communication** Time: 9am-10.30am
Subject Code: **18EC61** Max. Marks: **50**

Note: Answer any five full questions

Q. No.		Questions	M	COs	BCL*
1	a	Explain how to convert continuous AWGN channel into a vector channel	5	CO2	L1, 5
	b	Explain the Matched filter receiver. Obtain the expression for the impulse response of the Matched filter.	5		L1, 5
		OR			
2	a	Explain the Correlation receiver with neat diagram and explanation of detector and the Maximum –likelihood decoder blocks	6	CO2	L1
	b	Derive the statistical characterization of correlator outputs.	4		L1, 3
3	a	Obtain the Maximum Likelihood Decision rule for the signal detection problem.	10	CO2	L1, 5
		OR			
4	a	Show that for a noisy input the mean value of j^{th} correlator output Xj depends only on S_{ij} and all the correlators outputs Xj, j=1,2…..,N have a variance equal to the PSD $N_0/2$ of the additive noise process W(t).	7	CO2	L2, 5
	b	Write brief note on OQPSK	3		L2
5	a	Describe QPSK signal with its signal space diagram? With the help of a block diagram, Explain the QPSK Generation and Detection technique.	7	CO3	L3
	b	Sketch the QPSK waveform for the sequence 01101000	3		L1
		OR			
6	a	An FSK and DPSK system transmits binary data at the rate of 2×10^6 bits per second. During the course of transmission, AWGN of zero mean and two sided power spectral density 10^{-20} watts per hertz is added to the signal. The amplitude of the received sinusoidal wave for digit 0 or 1 is 1 microvolt. Find the average probability of symbol error assuming Non-coherent detection.	4	CO3	L1, 3
	b	With a neat block diagram explain the Non Coherent detection of binary frequency shift keying technique	6		L4
7	a	Derive the expression for the probability of error for a binary FSK (Frequency Shift Keying) Using coherent detection.	5	CO3	L2
	b	Explain BFSK system with the help of Transmitter and Receiver.	5		L3, 6
		OR			

8	**a**	Obtain the Constallation of QAM for M=16 and draw the siganl space diagram	**4**	CO 3	L 6
	b	Draw the block diagram of DPSK transmitter and explan for the binary sequence 1001000110, find the resulting wave form for DPSK system.	**6**		L 4, 6

9	**a**	Derive the expression for the probability of error for a binary PSK (Phase Shift Keying) Using coherent detection.	**7**	CO 3	L4
	b	Draw signal space diagram form BPSK and BFSK	**3**		L1 ,3
OR					
10	**a**	Explain BPSK system with the help of Transmitter and Receiver.	**7**	CO 3	L3
	b	Define Bandwidth efficiency. Tabulate and comment on bandwidth effiiency of M ary PSK signal for different values of M.	**3**		L3

*Bloom's Cognitive Levels: L1 – Remember, L2 – Understand, L3 – Apply, L4 – Analyze, L5 – Evaluate, L6– Create.

CO2: Prepare mathematical background for digital communication signals and systems

CO3: Understand and analyze various digital modulation and demodulation techniques

Quiz: Each question 1 mark (answer all questions)

1 *If we correlate the received signal with any one of the two orthogonal function, the obtained inner product will be*
   a. In phase
   b. Quadrature
   c. Zero
   d. Cannot be determined

2 *Matched filter provides ____ signal to noise ratio.*
   a. Maximum
   b. Minimum
   c. Infinity
   d. Zero

3 *If the maximum instantaneous phase transition of digital modulation techniques kept at 90°, the modulation will be organized as*
   a. DPSK
   b. QPSK
   c. OQPSK
   d. BPSK

4 *QAM uses _____ as the dimensions*.
   a. In phase
   b. Quadrature
   c. In phase & Quadrature
   d. None of the mentioned

5 *The maximum bandwidth is occupied by*
   a. ASK
   b. PSK
   c. FSK
   d. None of the above

6 *The binary waveform used to generate BPSK signal is encoded in*
   a. Bipolar NRZ format
   b. Manchester coding
   c. Differential coding
   d. None of the mentioned

7 *The bit rate of digital communication system is 34 M bits/sec. The Baud rate will be in QPSK modulation techniques*
   a. 8.5 M bits/sec
   b. 17 M bits/sec
   c. 32 M bits/sec
   d. 64 M bits/sec

8 *The modulation techniques employed in for telephone modems is ?*
   a. QAM
   b. PSK
   c. FSK
   d. QPSK

9 *According to the rule of minimizing the error probabilities, the hypothesis should be like if the priori probabilities are _____ than the ratio of likelihoods.*
   a. Lesser
   b. Greater
   c. Equal
   d. None of the mentioned

10 *The bit rate of the digital communication system is M kbps. The modulation used is 16QAM. The minimum bandwidth required for ideal transmission is*
   a. M/2 KHz
   b. M/16 KHz
   c. M KHz
   d. M/8 KHz

QP SETTER **QP REVIEWER** **HOD**

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III – Internal Assessment

SEM: **VI (A, B, C, D)** Date: 7/ 07 / 2022
Subject: **Digital Communication** Duration: **1 hr. 30 mins**
Sub. Code: **18EC61** Max. Marks: **50**

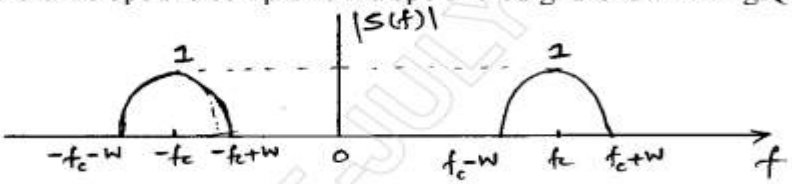
Q. No.		Questions	Marks	COs	BCL
1	a	With a neat block diagram explain the digital PAM transmission through bandlimited baseband channels and obtain the expression for ISI.	6	CO4	L2
	b	What is eye pattern? Draw the diagram showing effect of ISI on eye opening and list out the information inferred from the eye diagram.	4		L1
		OR			
2	a	What is Nyquist criterion for zero ISI? Give an example of the pulse with zero ISI. Draw the relevant waveform.	5	CO4	L2
	b	Obtain the expression for SNR of digital transmission through bandlimited channel.	5		L2
3	a	Explain the design of band limited signals with controlled ISI using Duo binary signal.	6	CO4	L2
	b	Explain modified duobinary controlled ISI with relevant expressions and waveforms	4		L2
		OR			
4	a	Explain the method for symbol detection with controlled ISI.	4	CO4	L2
	b	Consider the four level data sequence 0013120332010 which is the input to the precoder whose output is used to modulate a duobinary transmitting filter. Obtain the precoded sequence, transmitted amplitude levels, the received signal levels and the decoded sequence.	6		L3
5	a	What is channel equalization? With a neat block diagram explain the concept of equalization using a linear transversal filter	6	CO4	L2
	b	The binary sequence 10010110010 is the input to the precoder whose output is used to modulate a duobinary transmitting filter. Obtain the precoded sequence, transmitted amplitude levels, the received signal levels and the decoded sequence.	4		L3
		OR			
6	a	What are the benefits of using pulses having raised cosine spectrum in band limited channel.	3	CO4	L2
	b	Explain adaptive channel equalizer with relevant block diagram.	7		L2
7	a	Explain the model of a spread spectrum digital communication system.	5	CO5	L2
	b	Explain the generation of DSSS technique with relevant block diagram and waveform	5		L2
		OR			
8	a	With neat block diagram explain FHSS technique. Explain the term chip, chip rate and processing gain	6	CO5	L2
	b	Mention the application of DSSS. Explain any one briefly	4		L1
9	a	Explain with neat diagram the generation of PN sequence, Mention its properties	4	CO5	L2
	b	Draw the four stage linear feedback shift register with 1st and 4th stage connected to modulo 2 adder. Output of the modulo 2 adder is connected to 1st stage input. Find the output PN sequence. Consider initial state as 1000.	6		L3
		OR			
10	a	A slow frequency hopped / MFSK system has the following parameters: i) The number of bits / MFSK symbol =2 ii)The number of MFSK tones =4 (iii)Length of PN segment per hop =2 (iv)Total number of frequency hops = 4 Consider a binary input data 01110011110110000001 and PN sequence 0011011000. Draw the FH spectrum.	5	CO5	L3
	b	Explain with relevant block diagram IS- 95 forward link.	5		L2

*Bloom's Cognitive Levels: L1 – Remember, L2 – Understand, L3 – Apply, L4 – Analyze, L5 – Evaluate, L6 – Create.

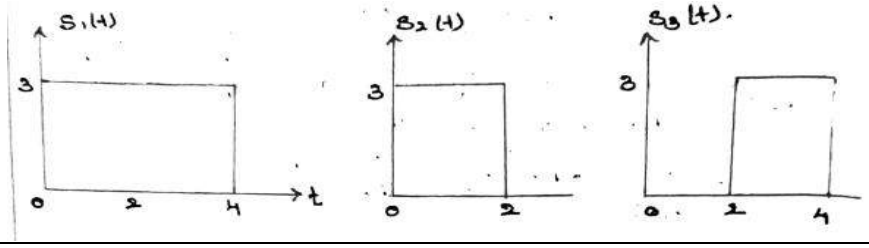
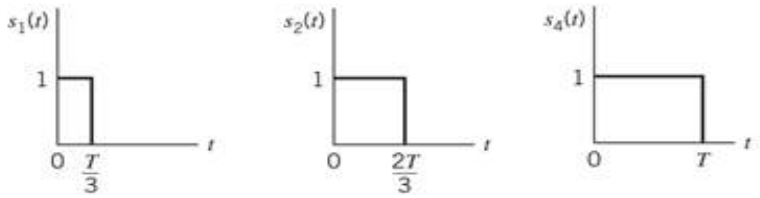
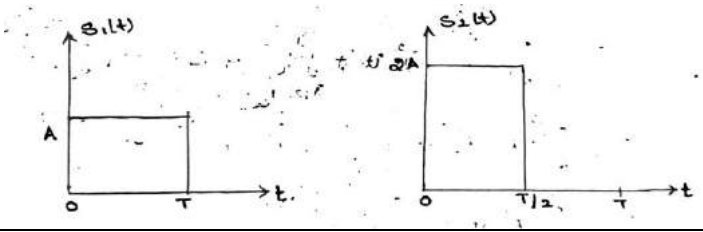
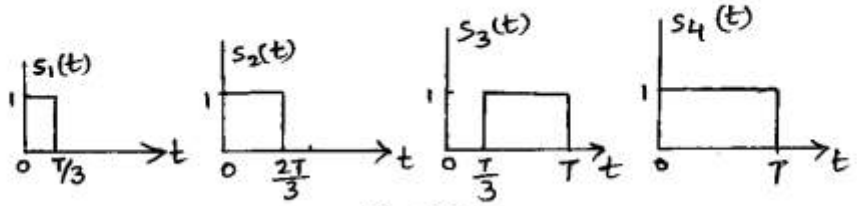
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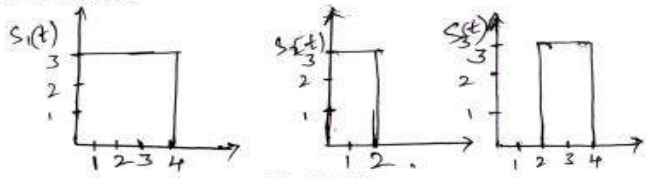
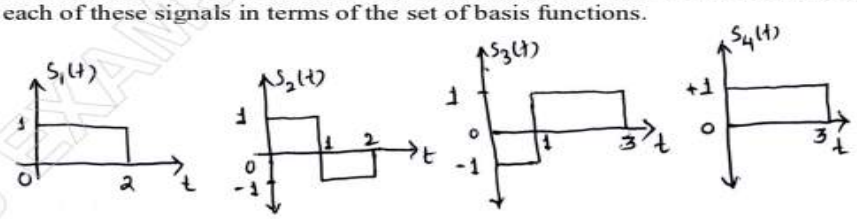
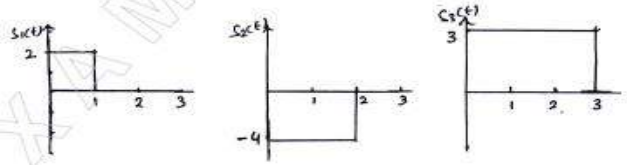
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DIGITAL COMMUNICATION 18EC61
Assignment-1

1	How can we modify the frequency content of a real – valued signal g(t), such that all negative frequency components are completely eliminated? Support your answer by necessary equations.	Co 1
2	Consider a low pass signal g(t), whose spectrum G(f) is defined for $-w \leq f \leq w$. Sketch the spectral contents of $g_+(t)$ and $g_-(t)$.	Co 1
3	Sketch the amplitude spectra of complex envelope of a bandpass signal S(t).	Co 1
4	Obtain the Canonical representation of band – pass signal and draw the schematic block diagrams for deriving the in – phase & quadrature components of a band – pass signal followed by its reconstruction using the same components.	Co 1
5	Show that $\tilde{H}(f-f_c) = 2H(f)$ for a bandpass system impulse response h(t) with Fourier transform H(f).	Co 1
6	For a given binary sequence 0 1 0 1 1 1 0 0 1 0 1 1, draw the following digital signaling formats. (i) Polar NRZ (ii) Bipolar NRZ (iii) Manchester Code iv) Unipolar NRZ	Co 1
7	Give the comparison of line codes by considering PSD analysis.	Co 1
8	For a given binary sequence, draw HDB3, B3ZS and B6ZS encoded signaling formats. **1 0 1 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 1 1 0 1 0 0 0 0**	Co 1
9	For the AM signal. s(t) = m(t) cos (2πft + ¢). Find the following: i. Pre-Envelope ii. Complex Envelope iii. In-Phase and Quadrature Component iv. Natural Envelope	Co 1
10	Obtain Hilbert transform of the following : i) x(t) = cos 2πfct + sin 2πfct ii) x(t) = $e^{-j2\pi fct}$ iii) x(t) = δ(t). iv) $x(t) = \sin t\,/t$ v) rect(t)	Co 1
11	Derive the expression for power spectral density of Manchester format and draw the spectrum.	Co 1
12	Code the binary pattern (i) 11100001011010000000000010 using HDB3 and bipolar NRZ (ii) 011000011 using B3ZS. Draw B3ZS waveform.	Co 1
13	Determine the pre-envelope and complex envelope of the signal shown in Fig.Q1(b).  Fig.Q1(b)	Co 1
14	For a binary sequence 0100000001011 construct i) RZBipolar format ii) Manchester format iii) B3Zs format iv) B6ZS format v) HDB3 format. Also mention the application of B3ZS and B6Zs formats.	Co 1
15	Consider a bandpass signal S(t) which is represented in terms of in-phase and quadrature components. Suggest a suitable scheme for : i) extracting the in-phase and quadrature components from the band pass signal ii) reconstructing the band pass signal from in-phase and quadrature components.	Co 1

Module 2

1	Using the Gram – Schmidt orthogonalization procedure, find a set of orthonormal basis functions for the signals $s_1(t),\ s_2(t)\ and\ s_3(t)$. sketch the resulting orthonormal basis functions 
2	Using the Gram – Schmidt orthogonalization procedure, find a set of orthonormal basis functions to represent the four signals $s_1(t),\ s_2(t), and\ s_4(t)$.And sketch the resulting orthonormal basis functions. Also draw the constellation diagram 
3	Explain the geometric representation of set of M energy signals as linear combination of N orthonormal basis function. Illustrate for the case N=2 and M=3 with necessary diagram and expressions.
4	Using the Gram – Schmidt orthogonalization procedure, find a set of orthonormal basis functions for the signals $s_1(t),\ s_2(t)$. sketch the resulting orthonormal basis functions. 
5	Show that for a noisy input, the mean value of the jth correlator output Xj depends only on Sij and all the correlators outputs Xj, j = 1, 2, - - - - , N, have a variance equal to the PSD No/2 of the additive noise process w(t).
6	For the signals $s_1(t)$, $s_2(t)$, $s_3(t)$ and $s_4(t)$ shown in Fig.3(a), find a set of orthonormal bas functions using gram–Schmidt orthogonalization procedure. **(09 Mark**  Fig.Q3(a)

7	b. Three signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ are shown in Fig.Q.4(b). Apply Gram Schmidt procedure to obtain an orthonormal basis for the signals. Express signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ in terms of orthonormal basis functions. **(08 Marks)**  Fig.Q.4(b)
8	Use Gram-Schmidt orthoganalization procedure and find the set of orthonormal basis functions to represent the four signals $S_1(t)$, $S_2(t)$, $S_3(t)$ and $S_4(t)$ shown in Fig.Q3(a). Also express each of these signals in terms of the set of basis functions.  Fig.Q3(a) **(08 Marks)**
9	Using the Gram – Schmidt Orthogonalization procedure, find a set of Orthonormal basis functions to represent the three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$, shown in Fig. Q3(a). **(10 Marks)**  Fig. Q3(a)
10	Explain the Geometric representation of signals. Illustrate the geometric interpretation of signals for the case of 2 – dimensional signal space with 3 signals S1(3, 1) , S2(1, 2) , S3(2,3).
11	Using the Gram – Schmidt orthogonalization procedure, find a set of orthonormal basis functions to represent the two signals $s_1(t)\ and\ s_2(t)$. And sketch the resulting orthonormal basis functions. $s_1(t) = \sqrt{\frac{2E}{T}} \cos 2\pi f_1 t \quad 0 \le t \le T,\ f_1 = \frac{n}{T}, \quad n - integer, n \ne 0$ $s_2(t) = \sqrt{\frac{2E}{T}} \cos 2\pi f_2 t \quad 0 \le t \le T,\ f_2 = \frac{m}{T}, \quad m - integer, m \ne 0$

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DIGITAL COMMUNICATION 18EC61
Assignment-2

1	Explain the operation of correlation receiver with relevant diagram	Co2
2	Explain how to convert continuous AWGN channel into a vector channel	Co2
3	What is a matched filter? Explain its properties.	Co2
4	Derive the statistical characterization of correlator outputs.	Co2
5	Obtain the Maximum Likelihood decision rule for the signal detection problem.	Co2
6	Explain the correlation receiver with neat diagram and explanation of detector and the Maximum –likelihood decoder blocks	Co2
7	Show that for a noisy input the mean value of j^{th} correlator output Xj depends only on S_{ij} and all the correlators outputs Xj, j=1,2…..,N have a variance equal to the PSD $N_0/2$ of the additive noise process W(t).	Co2
8	Explain the signal space representation for binary phase shift keying modulation. Also derive the expression for the probability of error for the BPSK.	Co3
9	Explain QPSK transmitter and receiver with neat block diagram.	Co3
10	Derive the expression for the probability of error for a binary PSK (Phase Shift Keying) Using coherent detection.	Co3
11	Explain BPSK system with the help of transmitter and receiver.	Co3
12	Obtain an expression for probability of symbol error for coherent binary FSK.	Co3
13	Describe QPSK signal with its signal space diagram? With the help of a block diagram, Explain the QPSK Generation and Detection technique.	Co3
14	Binary sequence dj (0010011001) Is applied to the DPSK Iransmitter. Obtain differentially encoded sequence. DPSK wavefomm and in the absence of noise, reconstruct the original binary scquence. Also write the phase shift in the carrier signal for the differentially encoded sequence.	Co3
15	Draw the block diagram of DPSK tr:insnitler and explan for the binary sequence 10010001 10, find the iesulting wave orm for DPSK system.	Co3
16	An FSK system transmits bina'y data a the rate of 2×10^6 bits per second. During the course ot trinsmission, AWGN of zero mean and two sided power spectral density 10^{-20} watts per hertz is added to the signal. The amplitude of the received sinusoidal wave for digit 0 or 1 is 1 microvolt. Find the average probability of symbol error assuming non-coherent detection.	Co3
17	Define Bandwidth efficiency. Tabulate and comment on bandwidth effiiency of M ary PSK signal for different values of M.	Co3
18	With a neat block diagram explain the Non Coherent detection of binary frequency shift keying technique	Co3
19	An FSK transmits binary data a the rate of 2.5×10^6 bps. During the coursc of transmission. AWGN of zero mean and PSD of 10^{-10} Watls.hz is added to the signal. In the absence of noise. amplitude of the received signal for digit 1 or 0 is 1 mV. Determine the average probability of symbol error for the following:1.BFSK using coherent detection.2. BFSK using non-coherent detection.	Co3
20	An FSK transmits binary data a the rate of 2×10^6 bps. During the coursc of transmission. AWGN of zero mean amd PSD of 10^{-20} Watls.hz is added to the signal. In the absence of noise. amplitude of the received signal for digit 1 or 0 is 1 microV. Determine the average probability of symbol error assuming non coherent detection	Co3
21	Derive an expression probability of error for binary FSK (Frequency Shift Keying) using coherent detection.	Co3
22	Binary data are transmitted over a microwave link at the rate of 10^6 bits/sec and the power spectral density of the noise at the receiver input is 10^{-10} W/Hz. Find the average carrier power required to maintain an average probability of error Pe $\leq 10^{-4}$ for the following cases.i) Binary PSK ii) DPSK Note: erfc(2.63)=2×10^{-4}, Q(3.7) = 10^{-4}	Co3
23	Sketch the QPSK waveform for the sequence 01101000	Co3
24	Obtain the Constallation of QAM for M=16 and draw the siganl space diagram	Co3

USN | | | | | | | | | |

INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MBA & RESEARCH CENTRE
III SEM MBA THIRD CONTINUOUS INTERNAL EVALUATION – FEBURARY 2022
DIRECT TAXATION

Time: 90 Mts **Max. Marks: 50**

Note: Answer any TWO FULL Questions from Question No.1 to 3 & Question No. 4 is compulsory

Q No.	Questions	Marks	PO:CO:BT
1a	Identify any six assets does not include under the term 'Capital asset'	3	1:4:4
1b	Explain the deductions u/s 54, 54B and 54F in brief	7	3:4:5
1c	Mr. Hari retires on 15th October 2020 from a Non-Government Organization, after serving 30 years and 7 months. He gets Rs. 3,80,000 as gratuity. His salary details are given below; F.Y. 2020-21 | Basic Rs. 16000 p.m | DA 50% of Salary (40% part of retirement benefits) F.Y.2019-20 | Basic Rs. 15000 p m | DA 50% of Salary (40% part of retirement benefits) Determine his taxable gratuity if the Organization is not covered by the Payment of Gratuity Act 1972.	10	5:3:5
2a	Who is specified Employee as per IT Act of 1961?	3	1:3:1
2b	Mr. Rahul retired from ACA Ltd., on 30th June 2019. He gets pension of Rs.4000 per month up to 31st December 2020. On 1st Jan 2021, he gets 40 % of pension commuted for Rs. 52800. Calculate taxable Pension. What difference it will make if he gets Rs. 45000 as Gratuity along with pension?	7	5:4:5
2c	Find out the amount that shall be included in the income under the head salaries in each of the following cases: a. Basic Pay Rs. 20,000 DP 10% of Basic Pay, Commission based on Fixed percentage of Turnover Rs. 1,20,000 for the whole year. HRA Rs. 5,000p.m Actual rent paid Rs. 4,000p.m., House situated in Agra. b. Basic Pay Rs. 30,000 DA @ 10% of Basic Pay, HRA Rs. 5000p.m, Actual rent paid Rs. 7000p.m., House situated in Mathura. c. Basic Pay Rs. 20,000 p m. DA @ 10% of Basic Pay, HRA Rs. 2000p.m, and actual rent paid Rs. 5,000p.m., House situated in Delhi.	10	3:4:5
3a	State any six fully exempted allowances	3	2:3:2
3b	Sri Om Prakash was manager in a company. He sought premature retirement from service on 1.11.2020 after completing 25 years of service. From 1.8.2019 his pay scale was Rs. 18000-900-24300 and he was getting DA of Rs.1800 p.m which was treated as salary for the purpose of retirement benefits. He had 7 months earned leave to his credit (on the basis of 30 days per year) which was approved; hence he was paid Rs. 132300 as salary and Rs. 12600 as DA. Compute the amount exempt regarding encashment of earned leave for the A.Y 2021-22.	7	5:4:5

RGIT MBA

3c	Mr. Hanuman submits the following particulars about sale of assets during the year 2020-21:	10	5:5:5

Particulars	Jewellery (Rs.)	Plot (Rs.)	Gold (Rs.)
Sale price	7,00,000	18,24,000	5,00,000
Expenses on sale	Nil	24,000	Nil
Cost of acquisition	1,29,000	2,26,000	1,48,000
Year of acquisition	2007-08	2004-05	2009-10

He has purchased a house for Rs.15,00,000 on 1.3.2021. Calculate the amount of taxable capital gain if CII for 2004-05, 2007-08 2009-10 and 2020-21 are 113, 129, 148 and 301 respectively.

4.	**Case study-Compulsory** Mr.Chandan is an employee of a textile company, Kanpur since 2010. He has submitted the following particulars of his income for the F Y 2020-21.	10	3:5:5

i	Net basic salary Rs.4,00,000 after deduction of contribution to RPF Rs.72,500 and rent of bungalow @ 10% of basic salary.
ii	DA Rs. 1000 p m (Rs. 200 p m enters into retirement benefits
iii	Education allowance for two children @ Rs.150 p m per child
iv	Commission of sales @ 1% Rs.10000
v	Entertainment allowance Rs. 700 p m
vi	Travelling allowance for his official tours Rs.30000, Actual expenses on tour amounted to Rs. 22000
vii	He resides in the bungalow of the Company. Its fair rent is Rs. 10000 p m. A watchman and Cook have been provided by the Company at the bungalow who were paid Rs. 4000 p ,m each.
viii	He has been provided with a large Motor Car for his official as well as personal use. The running and maintenance costs are borne by the Company.
ix	Employers contribution to RPF is Rs.47500 and the interest credited to this fund at 10% rate amounted to Rs.50000

Compute his Income from Salaries for the A Y 2021-22

RNSIT MBA

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ESTD : 2001

1	R	N							

DEPARTMENT OF MECHANICAL ENGINEERING

Semester: 7th SEM CV/CSE/ISE/EE **2nd INTERNAL TEST** **DATE: 22-12-2021**
Time: 9.00 am to 10.40 am **Sub: Energy and Environment** **Max. Marks: 50**

Sub Code: 18ME751

Note: Use of Compound Interest Table is permitted.

Q. No		Question	M	BCL	CO's
1.	a.	Distinguish between 'preliminary energy audit' and 'detailed energy audit'?	5	L2	CO2
	b.	What are the objectives of energy management?	5	L2	CO2
		OR			
2.	a.	Give a typical energy audit reporting format.	5	L2	CO2
	b	What are the principles of energy management?	5	L2	CO2
3	a.	List & Explain the steps involved in 'detailed energy audit'. (EA)	5	L2	CO2
	b.	What are the general characteristics of capital investment	5	L2	CO2
		OR			
4		Calculate the cost of generation per kWh for a power station having the following data: Installed capacity of the plant = 200 MW Capital cost = Rs 400 crores Rate of interest and depreciation = 12% Annual cost of fuel, salaries and taxation = Rs 5 crores Load factor = 40% Also estimate the saving in cost per kWh if the annual load factor is raised to 60%.	10	L3	CO2
5.		Company owns a premium plot. They have to decide which of the several alternatives to select in trying to obtain a desirable return on his investment. After much study and calculation, they decide that the two best alternatives are as given in the following table: Build Solar power plant: First cost (Rs.) 20,00,000; Annual property taxes (Rs.) 80,000; Annual income (Rs) 8,00,000; Life of land(years) 20 Build Hydro power plant: First cost (Rs.) 36,00,000; Annual property taxes (Rs.) 1,50,000; Annual income (Rs) 9,80,000; Life of land(years) 20 Evaluate the alternatives based on future worth method at i=15%	10	L3	CO2
		OR			
6.		There are two alternatives for purchasing a concrete mixer. Both the alternatives have same useful life. The cash flow details of alternatives are as follows; **Alternative-1**: Initial purchase cost = Rs.3,00,000, Annual operating and maintenance cost = Rs.20,000, Expected salvage value = Rs.1,25,000, Useful life = 5 years. **Alternative-2**: Initial purchase cost = Rs.2,00,000, Annual operating and maintenance cost = Rs.35,000, Expected salvage value = Rs.70,000, Useful life = 5 years. Using present worth method, find out which alternative should be selected, if the rate of interest is 10% per year.	10	L3	CO2

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ESTD : 2001

7	a.	Define Environment. Mention its scope	5	L2	CO3
	b.	What are the classifications of biotic and Abiotic components? Explain in brief.	5	L2	CO3
		OR			
8.	a.	Discuss the Environment related need for public awareness	5	L2	CO3
	b.	Bring out the difference between oxygen and nitrogen cycle	5	L2	CO3
9.	a.	List the types of ecosystem?	2	L2	CO3
	b.	What is an ecosystem? Discuss forest ecosystem. Explain how conservation of forest can be done.	8	L2	CO3
		OR			
10		Write a short note on (i) ecological succession (ii) food chain iii) food web iv) ecological pyramid.	10	L2	CO3

Blooms Cognitive Level: ***L1Remember, L2 Understand, L3Apply, L4Analyze, L5Evaluate, L6Create***

Q.No	18ME751: Energy and Environment Quiz-2	Marks	BCL	CO's
1.	All the environment crisis are solely due to_____rise a) Population b) Water quality c) Air quality d) None of the above	1	L2	CO2
2.	"The judicious and effective use of energy to maximize profits and enhancecompetitive positions". This can be the definition of: a) Energy conservation b) Energy management c) Energy policy d) Energy Audit	1	L2	CO2
3.	The liquid water component of earth is called ---------- --. a) Lithosphere b) Hemisphere c) Hydrosphere d) Atmosphere.	1	L2	CO2
4.	The objective of energy management includes a) Minimizing energy costs b) minimizing waste c) Minimizing environmental degradation d) all the above	1	L2	CO2
5.	A system without life a) Abiotic b) Biotic c) Stainable d) Organic	1	L2	CO3
6.	WHO stands for? a) World Hygiene Observation b) World Health Organization c) Wild Hazardous Organisms d) None the above	1	L2	CO3
7.	Energy manger should be well versed with a) Manufacturing and processing skills b) Technical and marketing skills c) Managerial and technical skills d) Managerial and commercial skills	1	L2	CO3
8.	Deforestation increases % of ----------in atmosphere. a) Oxygen b) Hydrogen c) Nitrogen d) Carbon di oxide.	1	L2	CO3
9.	A flesh eating animal a) Carnivore b) Herbivore c) Coalition d) Carboxylation	1	L2	CO3
10	An energy policy does not include a) Target energy consumption reduction b) Declaration of top management commitment c) Time period for reduction d) Future production projection	1	L2	CO3

********GOOD LUCK********

SUBJECT CODE: 18CS34 SUBJECT: Computer Organization STAFF: Dr. MJS

QNO	SCHEME AND SOLUTION	MARKS
1a.	Clock cycle - amount of the time needed to perform one basic operation	2
1b.	Interconnection b/w memory & processor - diagram (2M) Special registers - MAR, MDR, IR, PC - (2M) Functions of each registers - (4M)	8
2a.	Basic performance equation $T = \frac{N \times S}{R}$ - (1M) Explanation of role of parameters on T - (3M)	4

2b	SAFEPOP Compare #2000, SP
	Branch>0 EMPTYERROR
	Move (SP)+, ITEM
	
	SAFEPUSH Compare #1500, SP
	Branch≤0 FULLERROR
	Move NewItem, -(SP)
	With an assumption that stack runs from location 2000 to location 1500.
	Explanation of above codes with pictorial representation of push & pop operation (3M + 3M = 6M)
		6

3a Byte addressability - Successive address refers to successive memory locations in the memory (2M)

Two ways that byte addresses assigned across the word are - big endian and little endian assignments.

Explanation (2M) + Figure (2M) 6

3b.

```
Load  A, R0
Load  B, R1        (2M)
Add   R0, R1
Store R1, C
```

2

3c

1000	1001	1002	1003
g	n	e	b
1004	1005	1006	1007
r	u	l	a
1008	1009	1010	1011
		\0	u

little endian scheme 2

4a i) AND #20, R2

↓ 8bits ↓ 32bit + 4 bits remaining 17 bits for immediate value (2M)

ii) MOV 30(R1), R2

↓ 8 bits ↓ 4+3 bits ↓ 4+3 bits remaining 10 bits for index/offset (2M) 14

4b. C = A+B

3 address instruction : Add A, B, C (1M)

2 address : Move B C
Add A C } (2M)

1 address :
Load A
Add B
Store C } 3M

6

SUBJECT CODE: 18CS34 SUBJECT: Computer Organization STAFF: Dr. MJS

QNO	SCHEME AND SOLUTION	MARKS
5a	Conditional code flags : N (Negative) V (overflow) } explanation → (4M) Z (Zero) C (carry) }	4
5b.	Assembly code with proper explanation of each instruction and diagram showing various stack levels explanation with code (3M) diagram (3M)	6
6a.	Addressing mode - The ways in which different operands of an instruction are indicated (2M)	2
6b.	Addressing modes : i) Indirect (R_i) $EA = [R_i]$ ii) Index $X(R_i)$ $EA = [R_i] + X$ iii) Auto Increment $(R_i)+$ $EA = [R_i]$; incre R_i iv) Relative $X(PC)$ $EA = PC + X$ (2M×4)	8
7a.	Assembly program to read a line of characters until 'CR' key is pressed - program with proper comments	6

7b. Subroutine is the set of instructions which are executed many times in a program.

Link register is used to save return address.

Diagram with proper explanation (2M + 2M)

4

8a. (i) RotateR #2, R_0 (Rotate right without carry)

R_0 — 01100110 ... 00110 Initial value

10011001100 ... 001 C [0]

(ii) RotateL #3, R_0

001100 ... 00110011 C [1]

(iii) RotateRC #3, R_0

10011001100 ... 00 C [1]

(iv) RotateLC #3, R_0

11001100 ... 0011000 C [0]

(v) LShiftR #2, R_0

000110011100 ... 001 C [1]

9a. To check whether the first byte is 'Z' or not

4

```
MSBCMP   AND #$FF000000, R0
         CMP #$5A 000000, R0
         Branch = 0   SUCCESS   + comments
```

Subject Title : Subject Code :

Question Number	Solution	Marks Allocated

9b.	Add N-nos using indirect addressing mode.
	
	Move N, R1
	Move #NUM1, R2
	Clear R0
	Loop Add (R2), R0
	Add #4, R2
	Decrement R1
	Branch>0 LOOP
	Move R0, SUM
	
	program + tracing (4M) + (2M)
		6

10a.	Status and control registers in KB and display Status: | | | DIRQ | KIRQ | SOUT | SIN | Control: | | | | DEN | KEN | | Diagram (2M) + explanation (4M)	6
10b.	. I/O Device can alert the processor when it becomes ready by sending a hardware signal called as Interrupt. . One of the bus control line is Interrupt Request line is dedicated for this purpose. • Upon recognising interrupt, the processor sends an acknowledgement called as INTA (Interrupt acknowledgement signal).	4

QUIZ

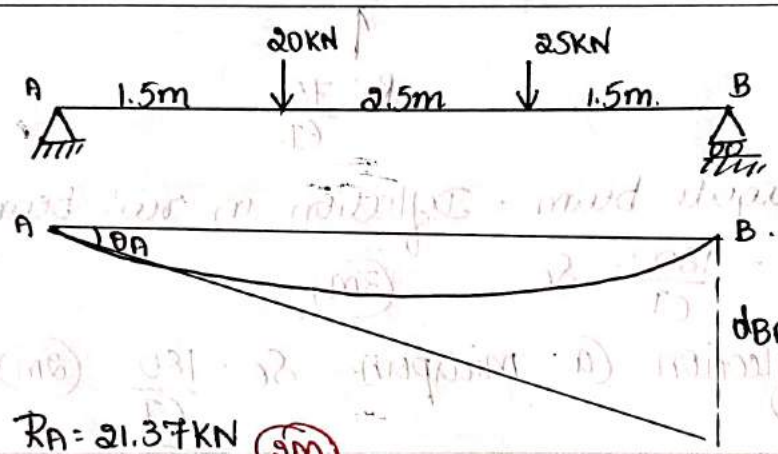
1. (b) accumulator
2. 8bits
3. (c) pop
4. True
5. (c) program counter
6. 1
7. (c) LINK
8. (a) SIN, SOUT
9. (c) ISR
10. (b) Memory mapped I/O

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Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098

Date of IA Test : 28-6-2022	SUB : ANALYSIS OF DETERMINATE STRUCTURES	Section : -
Branch : CIVIL	SUB CODE : 18CV42	Timings : 9 - 10.40 AM
Semester : IV	IA Test : I	Time Duration : 1 hour 40 minutes
Staff Incharge : MEGHAN GOWDA	Re-viewer Name :	Max Marks : 50
Staff Sign : J.S.	Re-viewer Sign :	HOD Sign :

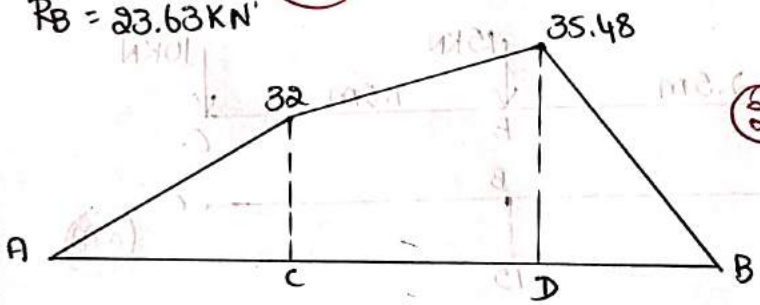
Q. No.	Solutions with Steps in Brief	Marks Allocation



(1m) (14m)

$R_A = 21.37 KN$ (2m)

$R_B = 23.63 KN$



(3m)

$d_{BA} = \frac{364.76}{EI}$ (1m)

$\theta_A = \frac{66.32}{EI}$ (3m)

$\theta_B = -\frac{68.64}{EI}$

Max deflection.

$x = 1.315m$ from 'C' (2m)

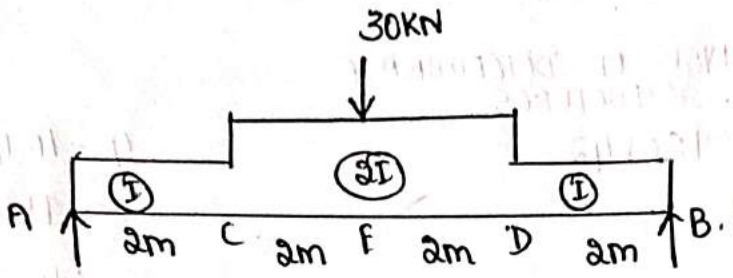
$y = 1.841m$ (1m)

Max deflection $= \frac{114.91}{EI}$ (2m)

$= 0.0143m$

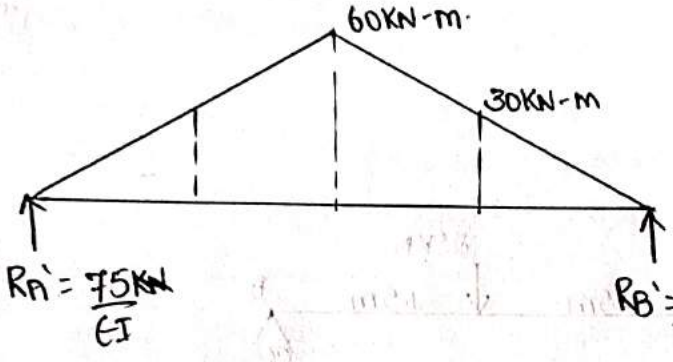
Q. No.	Solutions with steps in brief	Marks Allocation

(2)



Reactions

$R_A = R_B = 15KN$ (3m)



(6m)

BM in conjugate beam = Deflection in real beam.

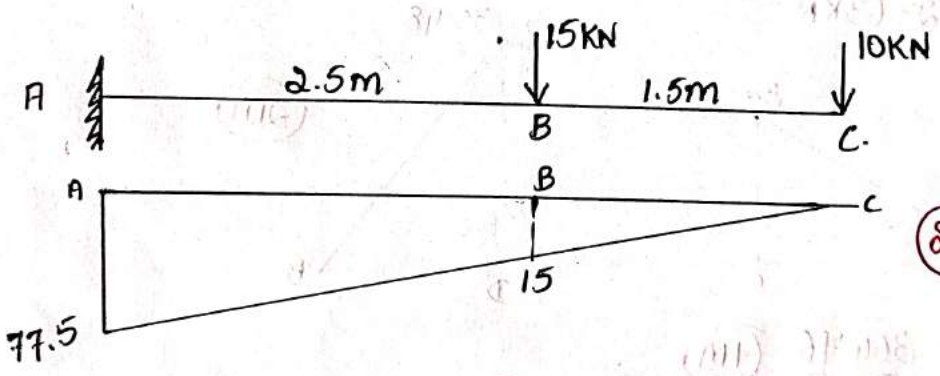
BM @ E' $= \frac{180}{EI} = \delta_E$ (3m)

∴ Max deflection @ midspan $\delta_E = \frac{180}{EI}$ (2m)

14

---

(3)



(2m)

8

$\theta_C = -0.015$ rad/m. (3m)

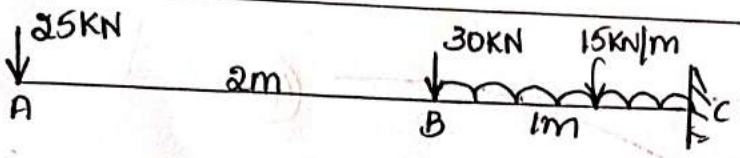
$\delta_C = \frac{(\text{Area of BMD b/w A and C})(\bar{x})}{EI}$ (1m)

$\delta_C = \frac{-361.77}{EI}$ (1m)

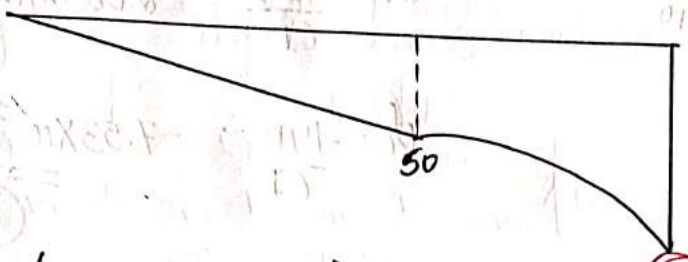
$= \frac{-361.77}{8000} = -0.0452m$ (1m)

	Solutions with steps in brief	Marks Allocation

(4)



BMD

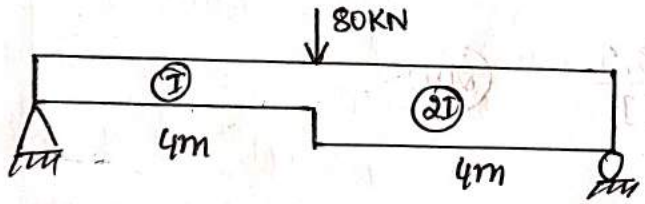


BM @ A = 0
@ B = -50 KN-m
@ C = -25(3) - 30(1) - 15(1)(1/2)
= ____ KN-m (2m)

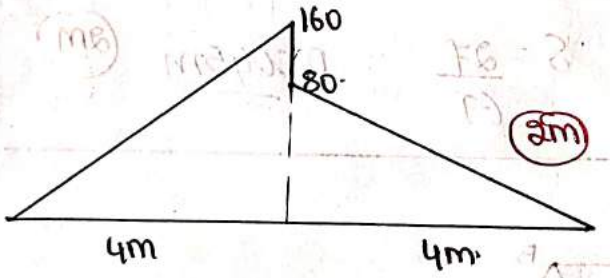
$\delta_A = \frac{(\text{Area of BMD})(\bar{x})}{EI}$ (2m)

(4m)

(5)



$R_A = R_B = 40\,KN$ (1m)



(2m)

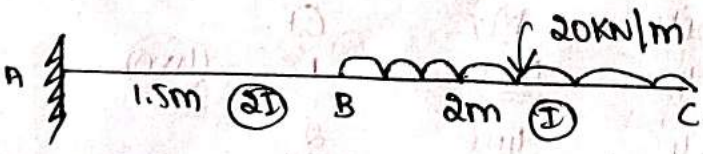
$\theta_A = \frac{320}{EI}$ (3m)

$\theta_B = \frac{160}{EI}$

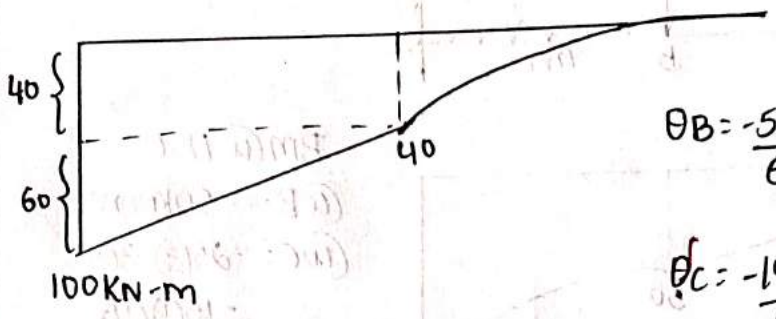
$\delta_C = \frac{(\text{Area of BMD})(\bar{x})}{EI} = \frac{2560}{3EI} = \frac{853.33}{EI}$ (2m)

8

(6)



Q. No.	Solutions with steps in brief	Allo



(4m)

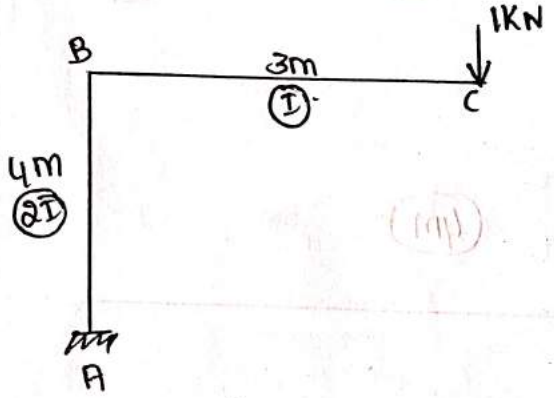
(8m)

$\theta_B = \frac{-52.5}{EI} = -2.083 \times 10^{-3}$ rad/m (2m)

$\theta_C = \frac{-190}{EI} = -7.53 \times 10^{-3}$ m. (2m)

---

(7)



Portion	BC	BA
Origin	C	B
Limits	0-3	0-4
EI	1	2
Mx	-1(x)	-1(3)
	-x	-3

(4m)

(8m)

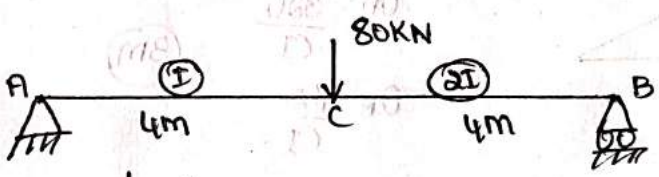
$U = \int_0^l \frac{m^2}{2EI} \cdot dx = \frac{13.5}{EI}$ (2m)

$W = U$

$\frac{1}{2} P\delta = \frac{13.5}{EI} \Rightarrow \delta = \frac{27}{EI} = 0.0045$m (2m)

---

(8)



$U = \int_0^l \frac{m^2}{2EI} \cdot dx.$

$R_A = R_B = 40$KN (1m)

Portion	origin	Limits	Mx	EI.
AC	A	0-4	40x	1
BC	B	0-4	40x	2

(4m)

Solutions with steps in brief	Marks Allocation

$$U = \int_0^4 \frac{(40x)^2}{2EI} \cdot dx + \int_0^4 \frac{(40x)^2}{2(2EI)} \cdot dx.$$

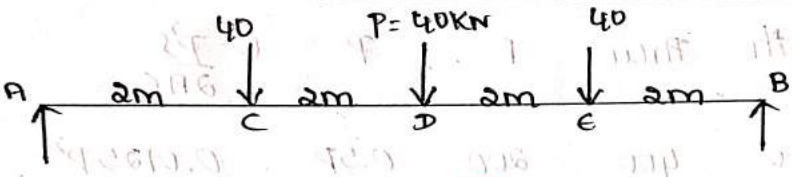
$U = 25600/EI.$ (8m)

Workdone = Strain energy stored.

$\frac{1}{2} PS = \frac{25600}{EI}.$

$S = \frac{640}{EI}.$

(9)



$R_A = R_B = 40 + 0.5P.$ (2m)

Portion	Origin	Limits	EI	Mx	
AC	A	0-2	1	$(40+0.5P)x.$	(6m)
CD	C	0-2	1	$(40+0.5P)(2+x) - 40x.$ $80+P+0.5Px.$	
DE	E	0-2	2	$80+P+0.5Px$	(12m)
EB	B	0-2	2	$(40+0.5P)x.$	

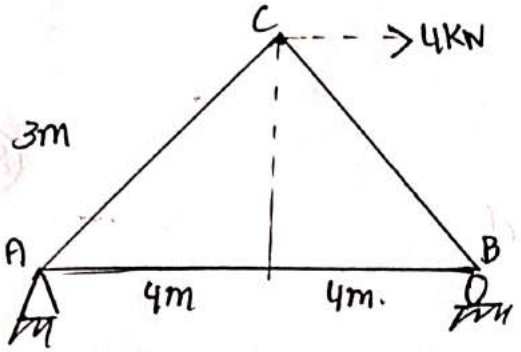
$\delta = \frac{\partial U}{\partial P} = \delta_1 + \delta_2 + \delta_3 + \delta_4$

$= \frac{80}{EI} + \frac{1280}{EI} + \frac{640}{EI} + \frac{40}{EI}$ (3m)

$\delta_D = \frac{760}{EI} = \frac{760}{2 \times 10^5} = 0.0038m$ (1m)

Q. No.	Solutions with steps in brief	Marks Allocation

(10)



$\theta = 36.86$ (1M)

$AC = BC = 5m$

Support Reactions

$H_A = P (\leftarrow)$ (1M)

$R_A = -R_B$ (1M)

$R_A = \frac{-3P}{8}$, $R_B = \frac{3P}{8}$ (1M)

12

Sl no	member	length	Area	E	P	$U = \frac{P^2 l}{2AE}$
	AB	8000	400	200	0.5P	$0.0125P^2$
	BC	5000	400	200	0.625P	$0.0122P^2$ (5M)
	AC	5000	400	200	0.62P	$0.0122P^2$

$U = \sum \frac{P^2 l}{2AE} = 0.0369P^2$ (1M)

$\delta_C = \frac{\partial U}{\partial P} = 0.0369(2P)$ (2M)

$P = 4KN$

$\delta_C = 0.2952$ mm

a b c
c a c
d c
b c

I – INTERNAL TEST : Digital Communication: SCHEME

1a Define Hilbert transform with relevant expression. State its properties. 4M

when the phase angles of all components of a given signal are shifted by ±90°, the resulting function of time is known as the Hilbert transform of the signal. The Hilbert transform is called a quadrature filter; it is so called to emphasize its distinct property of providing a ±90° phase shift.

To be specific, consider a Fourier transformable signal $g(t)$ with its Fourier transform denoted by $G(f)$. The *Hilbert transform* of $g(t)$, which we denote by $\hat{g}(t)$, is defined by[5]

$$\hat{g}(t) = \frac{1}{\pi}\int_{-\infty}^{\infty} \frac{g(\tau)}{t-\tau}\,d\tau \qquad (2.54)$$

Properties

ROPERTY 1 *A signal $g(t)$ and its Hilbert transform $\hat{g}(t)$ have the same magnitude spectrum.*

That is to say,

$$|G(f)| = |\hat{G}(f)|$$

PROPERTY 2 *If $\hat{g}(t)$ is the Hilbert transform of $g(t)$, then the Hilbert transform of $\hat{g}(t)$ is $-g(t)$.*

Another way of stating this property is to write

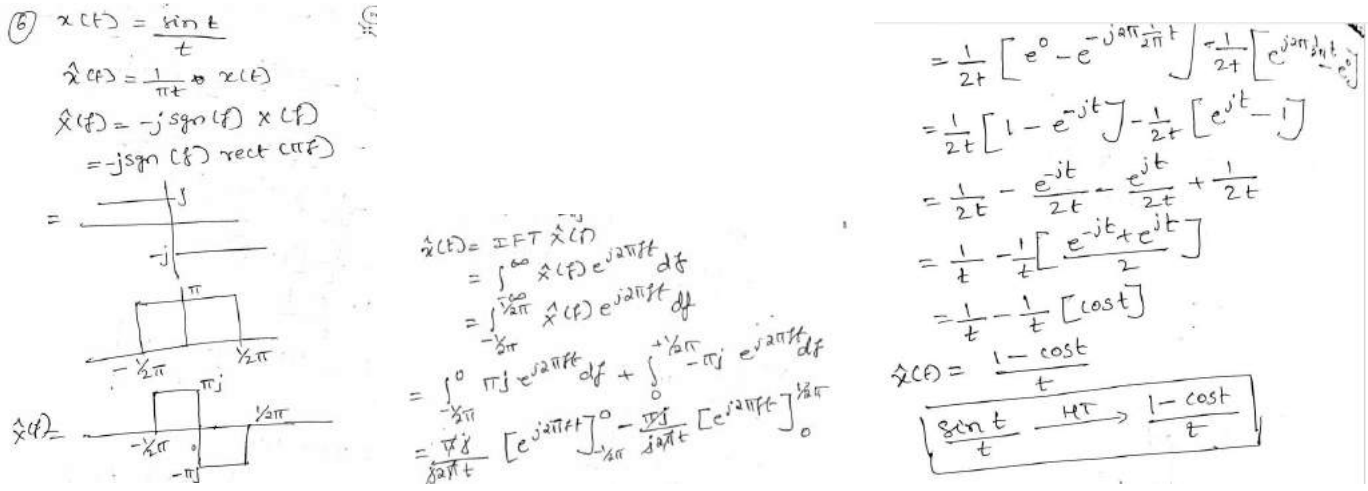
$$\arg[G(f)] = -\arg\{\hat{G}(f)\}$$

PROPERTY 3 *A signal $g(t)$ and its Hilbert transform $\hat{g}(t)$ are orthogonal over the entire time interval $(-\infty, \infty)$.*

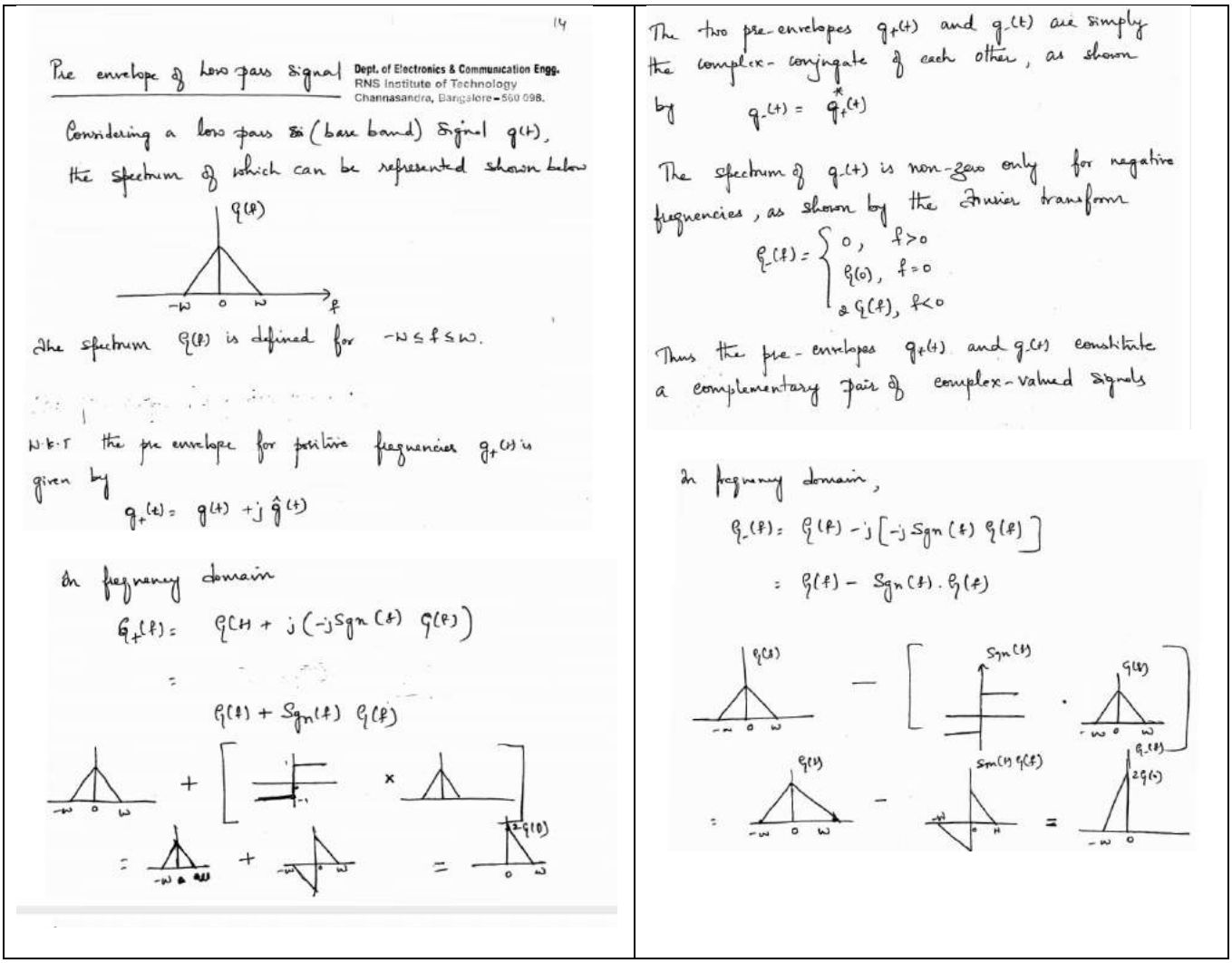
In mathematical terms, the orthogonality of $g(t)$ and $\hat{g}(t)$ is described by

$$\int_{-\infty}^{\infty} g(t)\hat{g}(t)dt = 0$$

1b. Find the Hilbert Transform of $x(t) = \sin t / t$.-6M



2a. Find the g_+ and g_- pre-envelope for lowpass signal g(t). -7M



Pre envelope of low pass signal

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Considering a low pass or (base band) signal $g(t)$, the spectrum of which can be represented shown below

The spectrum $G(f)$ is defined for $-W \le f \le W$.

W.k.T the pre envelope for positive frequencies $g_+(t)$ is given by

$$g_+(t) = g(t) + j\hat{g}(t)$$

In frequency domain

$$G_+(f) = G(f) + j(-j\,Sgn(f)\,G(f))$$

$$= G(f) + Sgn(f)\,G(f)$$

The two pre-envelopes $g_+(t)$ and $g_-(t)$ are simply the complex-conjugate of each other, as shown by

$$g_-(t) = g_+^*(t)$$

The spectrum of $g_-(t)$ is non-zero only for negative frequencies, as shown by the Fourier transform

$$G_-(f) = \begin{cases} 0, & f>0 \\ G(0), & f=0 \\ 2G(f), & f<0 \end{cases}$$

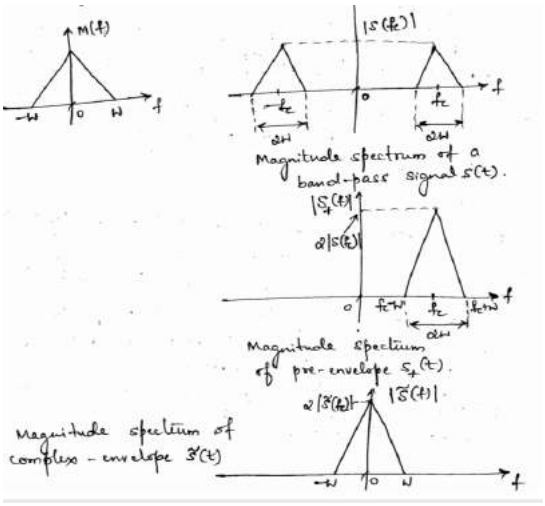
Thus the pre-envelopes $g_+(t)$ and $g_-(t)$ constitute a complementary pair of complex-valued signals

In frequency domain,

$$G_-(f) = G(f) - j[-j\,Sgn(f)\,G(f)]$$

$$= G(f) - Sgn(f).G(f)$$

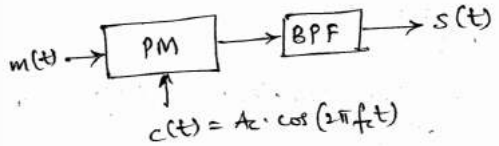
2b.Sketch the amplitude spectra of complex envelope of a bandpass signal S(t).-3M



3a. Obtain the Canonical representation of band – pass signal and draw the schematic block diagrams for deriving the in – phase & quadrature components of a band – pass signal followed by its reconstruction using the same components.-8M

→ Band-pass signal

i.e. $s(t) \rightleftharpoons S(f)$



Wkt, $s_+(t) = s(t) + j\,\hat{s}(t)$

$\therefore s(t) = Re\{s_+(t)\}$

but $s_+(t) = \tilde{s}(t) \cdot e^{j2\pi f_c t}$

$\therefore s(t) = Re\{\tilde{s}(t) \cdot e^{j2\pi f_c t}\}$

Since $\tilde{s}(t)$ is a complex-valued quantity, we can express it in Cartesian form as

$$\tilde{s}(t) = s_I(t) + j\,s_Q(t)$$

$$\therefore s(t) = Re\{[s_I(t) + j \cdot s_Q(t)]\, e^{j2\pi f_c t}\}$$

Since $\tilde{s}(t)$ is a complex-valued quantity, we can express it in Cartesian form as

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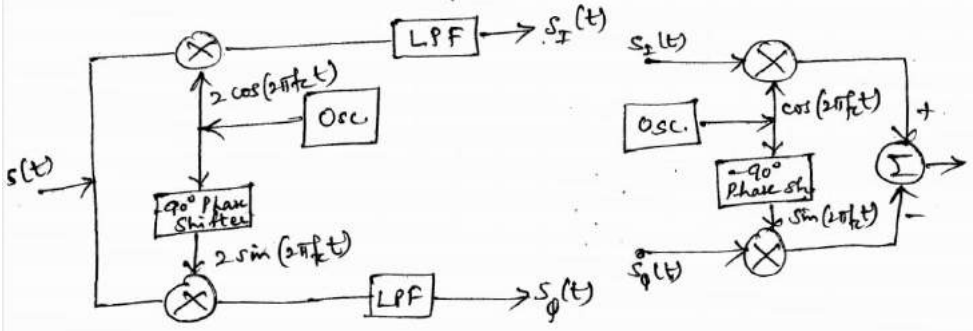
$$= Re\{[s_I(t) + j \cdot s_Q(t)][\cos(2\pi f_c t) + j \sin(2\pi f_c t)]\}$$

$$\boxed{s(t) = s_I(t)\cos(2\pi f_c t) - s_Q(t) \cdot \sin(2\pi f_c t)}$$

This is Canonical or standard form.

- $s_I(t)\cos(2\pi f_c t)$: In-phase component
- $s_Q(t) \cdot \sin(2\pi f_c t)$: Quadrature component.

→ $s_I(t)$ and $s_Q(t)$ are low-pass signals, limited to $-W \le f \le W$. They can be extracted from $s(t)$



3b.Obtain the Polar representation of band – pass signal.-2M

Polar Representation of Band-pass Signal. 20

$s(t) = Re\{\tilde{s}(t) \cdot e^{j2\pi f_c t}\}$

& $\tilde{s}(t) = s_I(t) + j \cdot s_Q(t)$ Cartesian form can be represented in Polar form

i.e. $\tilde{s}(t) = a(t) \cdot e^{j\phi(t)}$

where $a(t) = \sqrt{s_I^2(t) + s_Q^2(t)}$

$\phi(t) = \tan^{-1}\left[\frac{s_Q(t)}{s_I(t)}\right]$

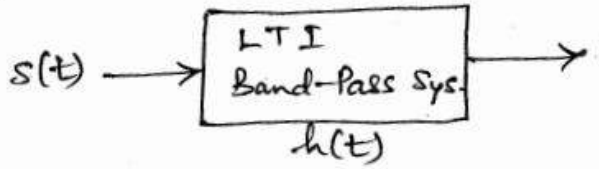
$s_I(t) = a(t) \cdot \cos\phi(t)$ & $s_Q(t) = a(t) \cdot \sin\phi(t)$

$\therefore s(t) = Re\{(a(t) \cdot e^{j\phi(t)})\, e^{j2\pi f_c t}\}$

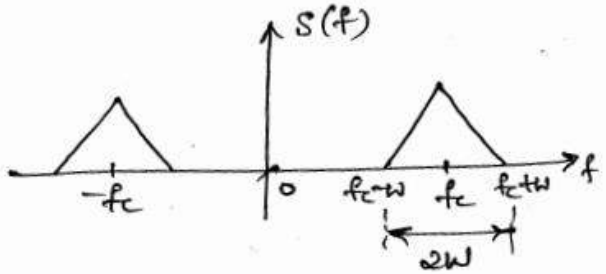
$= Re\{a(t) \cdot e^{j[\phi(t) + 2\pi f_c t]}\}$

4a. Show that $H\tilde{}(f-f_c) = 2H(f)$ for a bandpass system impulse response h(t) with Fourier transform H(f).-5M

Let us consider a linear time-invariant band-p system with impulse response $h(t)$ and frequency response $H(f)$.



Let $s(t)$ be a narrow band signal, with its F.T denoted by $S(f)$.



$\therefore$ Signal BW $= 2W$

Let system BW $= 2B$.

usually $2B \approx 2W$.

We wish to represent the band-pass impulse respons $h(t)$ in terms of two quadrature components, denoted by $h_I(t)$ and $h_Q(t)$.

i.e, $h(t) = h_I(t) \cdot \cos(2\pi f_c t) - h_Q(t) \cdot \sin(2\pi f_c t)$.

Correspondingly, we define its complex envelope as $\tilde{h}(t) = h_I(t) + j \cdot h_Q(t)$ and hence

$$h(t) = Re\{\tilde{h}(t) \cdot e^{j2\pi f_c t}\}$$

Now, there are TWO ways of determining $h(t)$.

(i) in terms of in-phase & quadrature components i.e, $h_I(t)$ and $h_Q(t)$.

(ii) from the band-pass frequency response $H(f)$. i.e, $h(t) = IFT\{H(f)\}$

Let's see the method (ii)

Consider $\tilde{h}(t) = h_I(t) + j \cdot h_Q(t)$ and we can obtain its complex-conjugate as $\tilde{h}^*(t) = h_I(t) - j \cdot h_Q(t)$

and wkt, $h(t) = Re\{\tilde{h}(t) \cdot e^{j2\pi f_c t}\}$

using this eq^n, let us perform

$$\left(\tilde{h}(t) \cdot e^{j2\pi f_c t}\right) + \left(\tilde{h}^*(t) \cdot e^{-j2\pi f_c t}\right)$$

$$= \left(h_I(t) + j \cdot h_Q(t)\right) e^{j2\pi f_c t} + \left(h_I(t) - j \cdot h_Q(t)\right) e^{-j2\pi f_c t}$$

$$= \left[h_I(t) + j \cdot h_Q(t)\right]\left[\cos(2\pi f_c t) + j \cdot \sin(2\pi f_c t)\right] +$$

$$\left[h_I(t) - j \cdot h_Q(t)\right]\left[\cos(2\pi f_c t) - j \cdot \sin(2\pi f_c t)\right]$$

$$= 2 \cdot h_I(t) \cdot \cos(2\pi f_c t) - 2 \cdot h_Q(t) \cdot \sin(2\pi f_c t)$$

$$= 2\left[h_I(t) \cdot \cos(2\pi f_c t) - h_Q(t) \cdot \sin(2\pi f_c t)\right]$$

$$= 2 \cdot h(t)$$

Thus, we can write

$$2 \cdot h(t) = \tilde{h}(t)\, e^{j2\pi f_c t} + \tilde{h}^*(t) \cdot e^{-j2\pi f_c t}$$

Applying F.T to above eq^n

$$2 \cdot H(f) = \tilde{H}(f - f_c) + \tilde{H}^*(-f - f_c)$$

Recall: If $x(t) \overset{F.T}{\rightleftharpoons} X(f)$

then $x^*(t) \overset{F.T}{\rightleftharpoons} X^*(-f)$ conjugate functions.

By considering only the frequencies, we can infer

$$\tilde{H}(f - f_c) = 2 \cdot H(f) \quad ; \quad f > 0$$

$$\Rightarrow \quad H(f) = \frac{1}{2}\tilde{H}(f - f_c)$$

4b. What are line codes? List the properties of Line Codes. Also list some applications.-5M

Digital data, a sequence of binary digits is coded into electrical pulses or waveforms for the purpose of transmission over the channel.

This process is called line coding or transmission coding. More often, line codes are also called signaling formats.

Properties of line codes

(1) Low transmission Bandwidth – It should be as low as possible.

(2) High Power Efficiency – Tx^{n} Power is low.

(3) Improved error detection and correction capabilities.

(4) Favourable power spectral density – The PSD of the line code should match the frequency response of the channel.

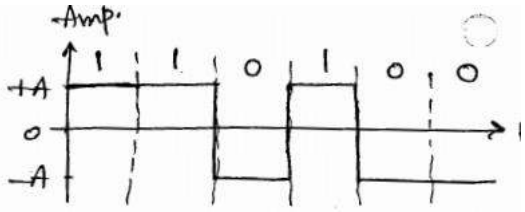
(5) Adequate timing information for clock recovery.

(6) Transparency – It should be possible to transmit a digital signal correctly irrespective of the pattern of 1's and 0's.

Applications: Telecommunication in PCM technique

5a. Derive the equation for Power Spectral Density (PSD) of NRZ polar signaling format and draw its normalized PSD.-5M

PSD of Polar NRZ



$$x(t) = \begin{cases} +A\ ; 0 \le t \le T_b\ ; \text{Logic 1} \\ -A\ ; 0 \le t \le T_b\ ; \text{Logic 0} \end{cases}$$

$$\therefore A_k = \begin{cases} +A\ ; 0 \le t \le T_b \text{ for Logic 1} \\ -A\ ; 0 \le t \le T_b \text{ for Logic 0} \end{cases}$$

Assuming all symbols are equiprobable

$$P(A_k = +A) = P(A_k = -A) = \frac{1}{2}$$

∴ Auto correlation function $R_A(n)$ can be written as

$$R_A(n) = \sum_{i=1}^{2} [A_k \cdot A_{k-n}] P_i$$

case(i) for $n = 0$, $R_A(0)$

$$R_A(n) = E[A_k \cdot A_k] = E[A_k^2]$$

$$= (+A)^2 \cdot \frac{1}{2} + (-A)^2 \cdot \frac{1}{2}$$

$$= \frac{A^2}{2} + \frac{A^2}{2} = A^2$$

Case (ii)

for $n \neq 0$, the product $(A_k \cdot A_{k-n})$ takes four possible values. ie,

	A_k	A_{k-n}	$A_k \cdot A_{k-n}$	P_i (Assuming all are equiprobable)
00	$+A$	$-A$	$+A^2$	1/4
01	$-A$	$+A$	$-A^2$	1/4
10	$+A$	$-A$	$-A^2$	1/4
11	$+A$	$+A$	$+A^2$	1/4

Now, $R_A(n) = \sum_{i=1}^{4} (A_k \cdot A_{k-n}) P_i$

$$= A^2(1/4) - A^2(1/4) - A^2(1/4) + A^2(1/4)$$

$$= 0$$

Summarizing, we get

$$R_A(n) = \begin{cases} A^2 & ; n = 0 \\ 0 & ; n \neq 0 \end{cases}$$

Now PSD, $S_x(f)$ is given by

$$S_x(f) = \frac{1}{T} |V(f)|^2 \sum_{n=-\infty}^{\infty} R_A(n) \cdot e^{-j2\pi n f T}$$

With $T = T_b$, we get

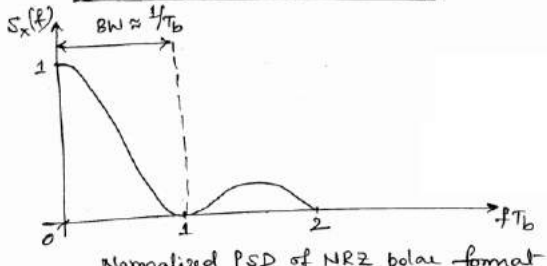
$$S_x(f) = \frac{1}{T_b} |V(f)|^2 \cdot R_A(0)$$

Wkt $V(f) = T_b \cdot \text{sinc}(fT_b)$

$$\therefore S_x(f) = \frac{1}{T_b} |T_b \cdot \text{sinc}(fT_b)|^2 \cdot A^2$$

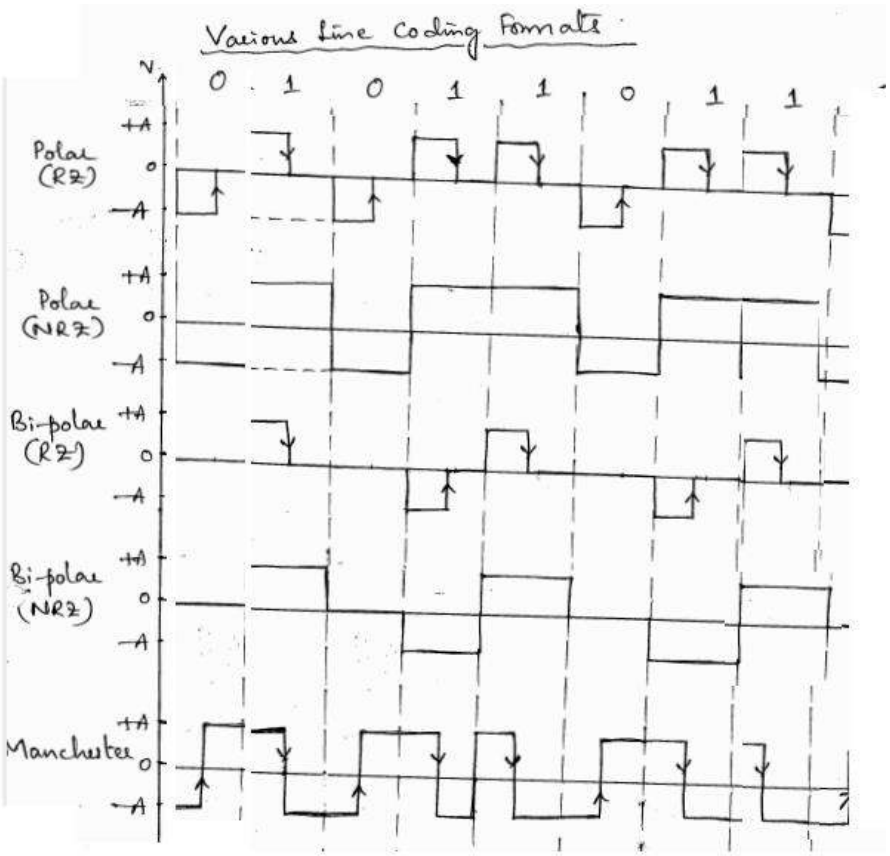
$$= T_b \cdot \text{sinc}^2(fT_b) \cdot A^2 = A^2 T_b \cdot \text{sinc}^2(fT_b)$$

$$\therefore \boxed{S_x(f) = A^2 \cdot T_b \cdot \text{sinc}^2(fT_b)}$$

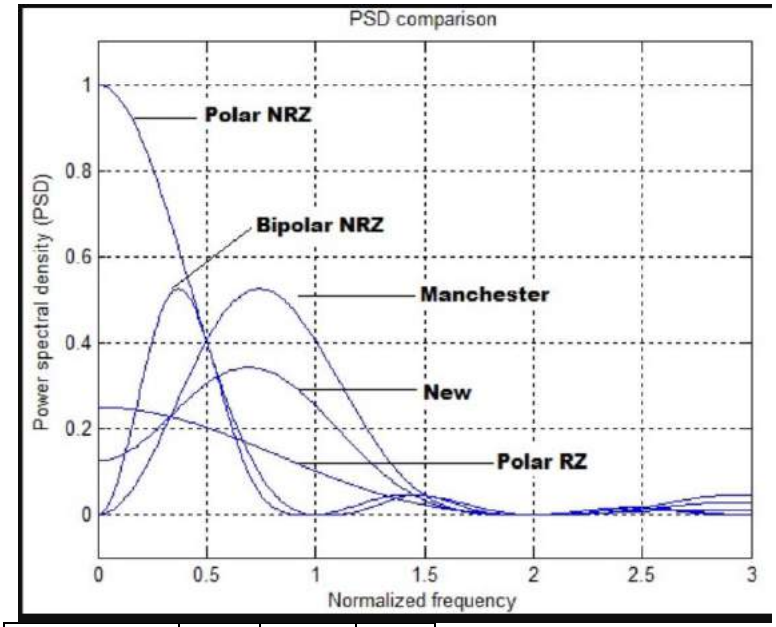


Normalized PSD of NRZ polar format.

5b.For a given binary sequence 0 1 0 1 1 0 1 1, draw the following digital signaling formats. (i) Polar NRZ (ii) Bipolar RZ (iii) Polar RZ (iv) Bipolar NRZ (v) Manchester Code.-5M



6a.Give the comparison of line codes by considering PSD analysis-4



code	BW	DC comp	Null DC
polar	$1/T_b$	no	yes
unipolar	$1/T_b$	yes	yes
bipolar	$1/T_b$	no	no
Manchester	$2/T_b$	no	no

6b.For the binary data sequence 1 0 1 0 0 0 0 1 1 0 0 0 0 0 0 0 1 1 0 0 0 given. sketch the encoded signal for following coding techniques, assuming first nonzero pulse is positive.-6M

(a)B6ZS (b) HDB3 (c)B3ZS

1	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**
1	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**
1	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**

7a.Explain Gram – Schmidt orthogonalization procedure-5

Gram–Schmidt Orthogonalization Procedure

Having demonstrated the elegance of the geometric representation of energy signals with an example, how do we justify it in mathematical terms? The answer to this question lies in the *Gram–Schmidt orthogonalization procedure*, for which we need a *complete orthonormal set of basis functions*. To proceed with the formulation of this procedure, suppose we have a set of M energy signals denoted by $s_1(t)$, $s_2(t)$, ..., $s_M(t)$. Starting with $s_1(t)$ chosen from this set arbitrarily, the first basis function is defined by

$$\phi_1(t) = \frac{s_1(t)}{\sqrt{E_1}} \qquad (7.18)$$

$$s_1(t) = \sqrt{E_1}\phi_1(t)$$
$$= s_{11}(t)\phi_1(t)$$

where the coefficient $s_{11} = \sqrt{E_1}$ and $\phi_1(t)$ has unit energy as required.

Next, using the signal $s_2(t)$, we define the coefficient s_{21} as

$$s_{21} = \int_0^T s_2(t)\phi_1(t)\,dt$$

We may thus introduce a new intermediate function

$$g_2(t) = s_2(t) - s_{21}\phi_1(t) \tag{7.19}$$

which is orthogonal to $\phi_1(t)$ over the interval $0 \le t \le T$ by virtue of the definition of s_{21} and the fact that the basis function $\phi_1(t)$ has unit energy. Now, we are ready to define the second basis function as

$$\phi_2(t) = \frac{g_2(t)}{\sqrt{\int_0^T g_2^2(t)\,dt}} \tag{7.20}$$

Substituting (7.19) into (7.20) and simplifying, we get the desired result

$$\phi_2(t) = \frac{s_2(t) - s_{21}\phi_1(t)}{\sqrt{E_2 - s_{21}^2}} \tag{7.21}$$

where E_2 is the energy of the signal $s_2(t)$. From (7.20) we readily see that

$$\int_0^T \phi_2^2(t)\,dt = 1$$

in which case (7.21) yields

$$\int_0^T \phi_1(t)\phi_2(t)\,dt = 0$$

That is to say, $\phi_1(t)$ and $\phi_2(t)$ form an orthonormal pair as required.

Continuing the procedure in this fashion, we may, in general, define

$$g_i(t) = s_i(t) - \sum_{j=1}^{i-1} s_{ij}\phi_j(t)$$

where the coefficients s_{ij} are themselves defined by

$$s_{ij} = \int_0^T s_i(t)\phi_j(t)\,dt, \qquad j = 1, 2, \ldots, i-1$$

For $i = 1$, the function $g_i(t)$ reduces to $s_i(t)$.

Given the $g_i(t)$, we may now define the set of basis functions

$$\phi_i(t) = \frac{g_i(t)}{\sqrt{\int_0^T g_i^2(t)\,dt}}, \qquad j = 1, 2, \ldots, N$$

8a.Explain the geometric representation of set of M energy signals as linear combination of N orthonormal basis function. Illustrate for the case N=2 and M=3 with necessary diagram and expressions.-5

Geometric representation of signals

The essence of geometric representation of signals is to represent any set of M energy signals $\{s_i(t)\}$ as a linear combinations of N orthogonal basis functions, where $N \le M$.

Given a set of real-valued energy signals, $s_1(t)$, $s_2(t)$ ... $s_M(t)$, each of duration T seconds, we write

$$s_i(t) = \sum_{j=1}^{N} s_{ij}\phi_j(t), \quad \begin{cases} 0 \le t \le T \\ i = 1, 2, \ldots M \end{cases}$$

where δ_{ij} is the kronecker delta.

We note that

(i) The basis functions $\phi_1(t), \phi_2(t), \ldots, \phi_N(t)$ are orthogonal with respect to each other over the interval $0 \le t \le T$.

(ii) $\phi_1(t), \phi_2(t), \ldots \phi_N(t)$ are orthogonal with respect to each other over the interval $0 \le t \le T_b$.

Each signal $s_i(t)$ is completely determined by the vector of its coefficients, as shown by

$$s_i = \begin{bmatrix} s_{i1} \\ s_{i2} \\ s_{i3} \\ \vdots \\ s_{iN} \end{bmatrix} \qquad i = 1, 2, \ldots M$$

Vector s_i as defined above is called signal vector.

For prescribed i, the set of coefficients $\{s_{ij}\}_{j=1}^{N}$ may be viewed as an N-dimensional signal vector denoted by s_i

Vector s_i bears one-to-one relationship with the transmitted signal $s_i(t)$.

where the coefficients of the expansion are defined as

$$s_{ij} = \int_0^T s_i(t)\, \phi_j(t)\, dt, \qquad \begin{cases} i = 1, 2, \ldots M \\ j = 1, 2, \ldots N \end{cases}$$

The real valued basis functions $\phi_1(t), \phi_2(t) \ldots \phi_N(t)$ form an orthonormal set, by which we mean

$$\int_0^T \phi_i(t)\, \phi_j(t)\, dt = \delta_{ij} = \begin{cases} 1 & \text{if } i = j \\ 0 & \text{if } i \neq j \end{cases}$$

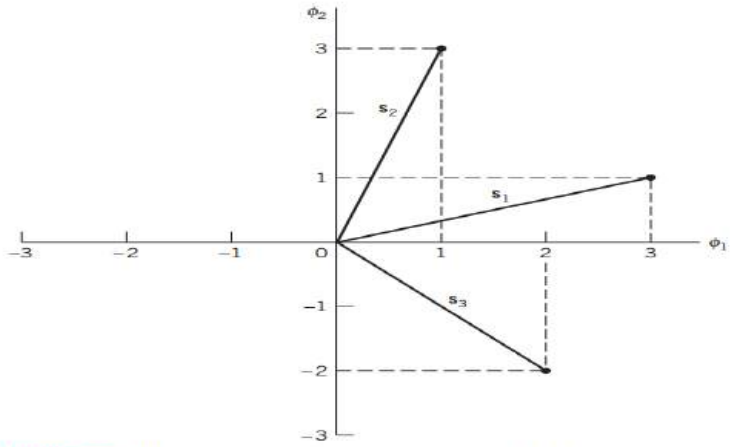


Figure 7.3 Illustrating the geometric representation of signals for the case when $N = 2$ and $M = 3$.

8b.Show that energy of a signal is a squared length of corresponding signal Vector.-5M

In an N-dimensional Euclidean space, we may define *lengths* of vectors and *angles* between vectors. It is customary to denote the length (also called the *absolute value* or *norm*) of a signal vector $\mathbf{s}_i$ by the symbol $\|\mathbf{s}_i\|$. The squared length of any signal vector $\mathbf{s}_i$ is defined to be the *inner product* or *dot product* of $\mathbf{s}_i$ with itself, as shown by

$$\|\mathbf{s}_i\|^2 = \mathbf{s}_i^{\mathrm{T}}\mathbf{s}_i = \sum_{j=1}^{N} s_{ij}^2, \qquad i = 1, 2, \ldots, M \tag{7.8}$$

where s_{ij} is the jth element of $\mathbf{s}_i$ and the superscript T denotes matrix transposition.

There is an interesting relationship between the energy content of a signal and its representation as a vector. By definition, the energy of a signal $s_i(t)$ of duration T seconds is

$$E_i = \int_0^T s_i^2(t)\,dt, \qquad i = 1, 2, \ldots, M \tag{7.9}$$

Therefore, substituting (7.4) into (7.9), we get

$$E_i = \int_0^T \left[\sum_{j=1}^{N} s_{ij}\phi_j(t)\right]\left[\sum_{k=1}^{N} s_{ik}\phi_k(t)\right] dt$$

Interchanging the order of summation and integration, which we can do because they are both linear operations, and then rearranging terms we get

$$E_i = \sum_{j=1}^{N}\sum_{k=1}^{N} s_{ij}s_{ik}\int_0^T \phi_j(t)\phi_k(t)\,dt \tag{7.10}$$

Since, by definition, the $\phi_j(t)$ form an orthonormal set in accordance with the two conditions of (7.6), we find that (7.10) reduces simply to

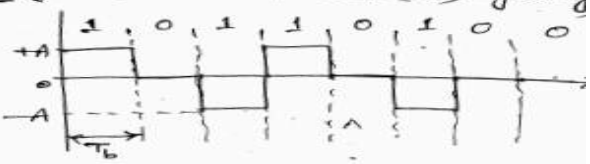
$$E_i = \sum_{j=1}^{N} s_{ij}^2 = \|\mathbf{s}_i\|^2 \tag{7.11}$$

Thus, (7.8) and (7.11) show that the energy of an energy signal $s_i(t)$ is equal to the squared length of the corresponding signal vector $\mathbf{s}_i(t)$.

10a. Obtain the Power Spectral Density (PSD) of NRZ bipolar format and draw its normalized PSD.-7

(3) PSD of Bi-polar NRZ (Alternate Mark Inverted (AMI) signaling

In the NRZ-Bipolar format, the discrete random variable A_k takes the following values.



$$A_k = \begin{cases} \pm A, & \text{for logic 1} \\ 0, & \text{for logic 0.} \end{cases}$$

Assuming 0s and 1s are equiprobable, we can write

$P(A_k = 0) = \frac{1}{2}$

$P(A_k = \pm A) = \frac{1}{2}$ i.e, $P(A_k = +A) = \frac{1}{4}$ and $P(A_k = -A) = 1/4$.

To find the auto-correlation function, let's take first case; for

i) $n = 0$, the product $(A_k \cdot A_k)$ are

$0 \times 0 = 0$; $A \times A = A^2$;

$-A \times -A = (-A)^2 = A^2$.

Therefore

$$R_A(0) = 0^2\left(\frac{1}{2}\right) + A^2\left(\frac{1}{4}\right) + A^2\left(\frac{1}{4}\right)$$

$$= \frac{A^2}{4} + \frac{A^2}{4}$$

$\therefore R_A(0) = \frac{A^2}{2}$

(ii) For $n = \pm 1$ (the adjacent bit case) Taking $n = 1$ $\because R_A(-n) = R_A(n)$ (1+)

The dibit represented by the sequence (A_{k-1}, A_k) can assume only four possible forms: (0,0), (0,1), (1,0) and (1,1). Then the possible $(A_k \cdot A_{k-1})$ products are as given below

Data	Product $(A_k \cdot A_{k-1})$
(0,0)	$0 \times 0 = 0$
(0,1)	$0 \times \pm A = 0$
(1,0)	$\pm A \times 0 = 0$
(1,1)	$\pm A \times \mp A = -A^2$ (∵ Successive 1s alternate in polarity.)

Each of these values occur with a probability of $1/4$.

$$\therefore R_A(1) = \sum_{i=1}^{4} (A_k \cdot A_{k-1})\, P_i$$

$$= 0\left(\frac{1}{4}\right) + 0\left(\frac{1}{4}\right) + 0\left(\frac{1}{4}\right) + (-A^2)\left(\frac{1}{4}\right)$$

$$= -\frac{A^2}{4}.$$

(iii) For $n > 1$, the bits being considered are not adjacent. Then the products $(A_k \cdot A_{k-n})$ are $0, 0, 0$ & $\pm A^2$ and these are equiprobable with a probability of $1/4$. i.e.,

$P(0) = 1/4$

$P(\pm A^2) = 1/4 \Rightarrow P(+A^2) = \frac{1}{8}$

$P(-A^2) = \frac{1}{8}$.

(0,0) $\rightarrow 0 \times 0 = 0$

(0,1) $\rightarrow 0 \times \pm A = 0$

(1,0) $\rightarrow \pm A \times 0 = 0$

(1,1) $\rightarrow$ $+A \times +A = A^2$, $-A \times -A = A^2$, $+A \times -A = -A^2$ $\Big\} \pm A^2$

$$\therefore R_A(n>1) = \sum_{i=1}^{5} (A_k \cdot A_{k-n})\, p_i$$

$$= 0\left(\tfrac{1}{4}\right) + 0\left(\tfrac{1}{4}\right) + 0\left(\tfrac{1}{4}\right) + A^2\left(\tfrac{1}{8}\right) - A^2\left[\tfrac{1}{8}\right]$$

$$= \frac{A^2}{8} - \frac{A^2}{8} = 0$$

Summarizing all

$$R_A(n) = \begin{cases} A^2/2 & ; \ n = 0 \\ -A^2/4 & ; \ |n| = 1 \\ 0 & ; \ |n| > 1 \end{cases}$$

Since $R_A(n) = R_A(-n)$ i.e. Auto-correlation is an even function.

Finally,

$$S_x(f) = \frac{1}{T_b} |V(f)|^2 \cdot \sum_{n=-\infty}^{\infty} R_A(n) \cdot e^{-j2\pi f n T_b}$$

$$S_x(f) = \frac{1}{T_b} \cdot T_b^2 \cdot \text{sinc}^2(fT_b)\left[R_A(-1) \cdot e^{j2\pi f T_b} + R_A(0) \cdot 1 + R_A(1) \cdot e^{-j2\pi f T_b}\right]$$

Since $R_A(-1) = R_A(1)$ and

$$\left(e^{j2\pi f T_b} + e^{-j2\pi f T_b}\right) = 2 \cdot \cos(2\pi f T_b)$$

$$S_x(f) = \frac{1}{T_b} \cdot T_b^2 \cdot \text{sinc}^2(fT_b)\left[2 \cdot R_A(1) \cdot \cos(2\pi f T_b) + R_A(0)\right]$$

$$= T_b \cdot \text{sinc}^2(fT_b)\left[-\frac{2A^2}{4}\cos(2\pi f T_b) + \frac{A^2}{2}\right]$$

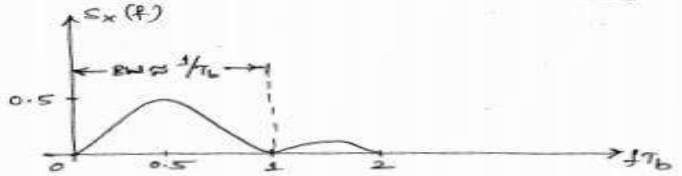
$$= T_b \cdot \text{sinc}^2(fT_b)\left[\frac{A^2}{2} - \frac{A^2}{2}\cos(2\pi f T_b)\right]$$

$$= T_b \cdot \text{sinc}^2(fT_b) \cdot \frac{A^2}{2}\left[1 - \cos(2\pi f T_b)\right]$$

$$\therefore S_x(f) = T_b \cdot \text{sinc}^2(fT_b) \cdot \frac{A^2}{2} \cdot 2 \cdot \sin^2(\pi f T_b) \quad (1)$$

$$\therefore S_x(f) = T_b \cdot \text{sinc}^2(fT_b) \cdot A^2 \cdot \sin^2(\pi f T_b) \quad \left(\because \frac{1-\cos(2\theta)}{2} = \sin^2\theta\right)$$

$$\boxed{S_x(f) = A^2 T_b \cdot \text{sinc}^2(fT_b) \cdot \sin^2(\pi f T_b)}$$



Normalised PSD of NRZ - Bipolar - format

10b.Explain the following with respect to geometric representation -3M

i)Length of a vector (ii) Angle between two vectors (iii) Euclidian distance.

The squared length of any signal vector si is defined to be the inner product or dot product of si with itself, as shown by

$$\|\mathbf{s}_i\|^2 = \mathbf{s}_i^{\mathrm{T}}\mathbf{s}_i$$

Euclidean distance d_{ik} between the points represented by the signal vectors si and sk.

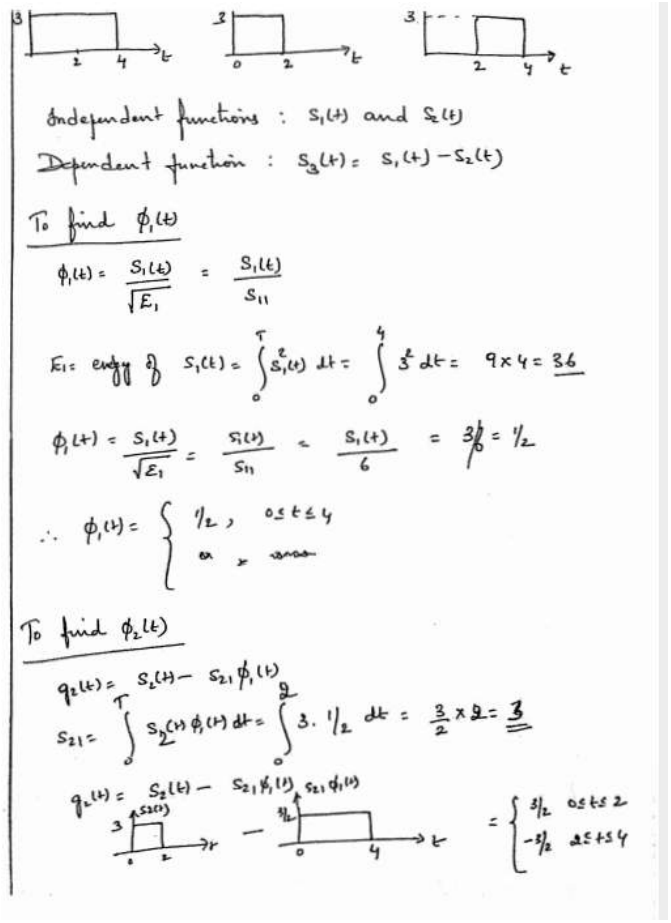
$$\|\mathbf{s}_i - \mathbf{s}_k\|^2 = \sum_{j=1}^{N} (s_{ij} - s_{kj})^2$$

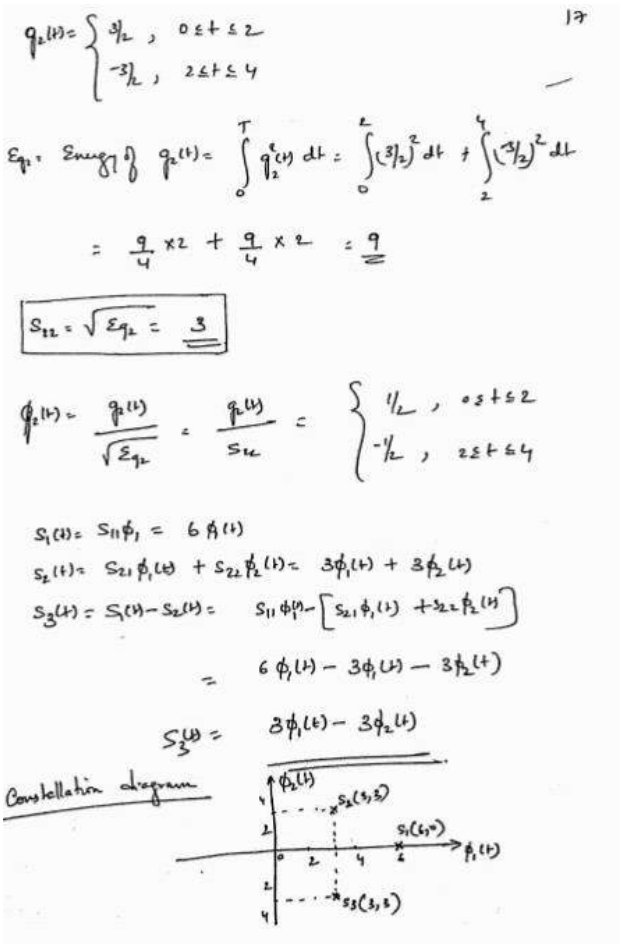
$$= \int_0^T (s_i(t) - s_k(t))^2 \, \mathrm{d}t$$

By definition, the cosine of the angle is equal to the inner product of these two vectors divided by the product of their individual norms, as shown by

$$\cos(\theta_{ik}) = \frac{\mathbf{s}_i^{\mathrm{T}} \mathbf{s}_k}{\|\mathbf{s}_i\| \|\mathbf{s}_k\|}$$

7b.Using the Gram – Schmidt orthogonalization procedure, find a set of orthonormal basis functions for the signals $s_1(t)$, $s_2(t)$ and $s_3(t)$. sketch the resulting orthonormal basis functions.-5





9a.**Using the Gram – Schmidt orthogonalization procedure, find a set of orthonormal basis functions to represent the four signals $s_1(t)$, $s_2(t)$, and $s_4(t)$.And sketch the resulting orthonormal basis functions.-7M**

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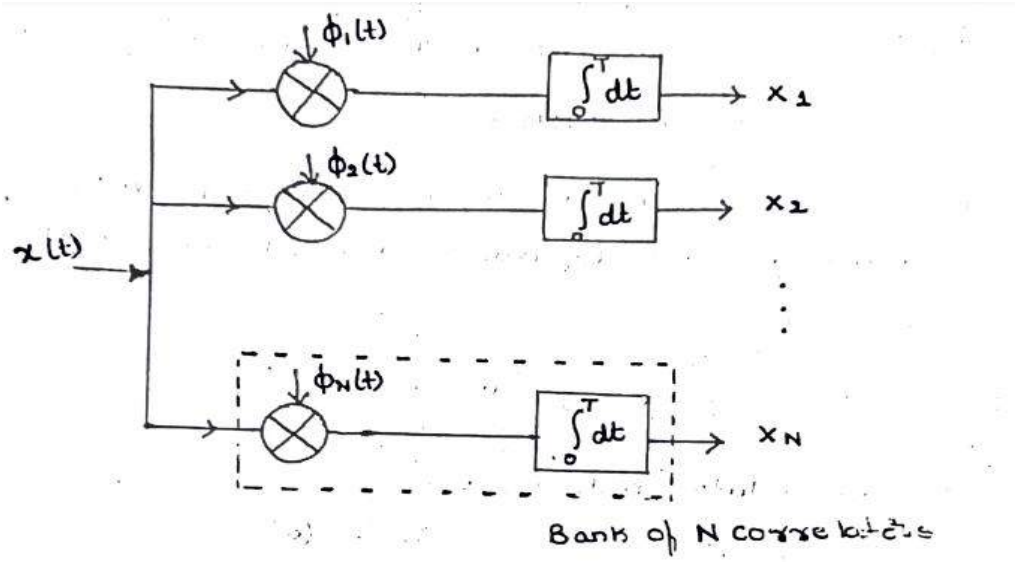
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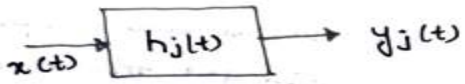
II – INTERNAL TEST SCHEME

Subject: Digital Communication / 18EC61 **Date: 9/6/2022**

Faculty: Mrs. Smitha Gayathri D.

Q. No.		Questions	M
1	a	Explain how to convert continuous AWGN channel into a vector channel	5
		 Bank of N correlators	2
		• The input to the correlator is $r(t) = s_i(t) + w(t); \quad 0 \le t \le T, \quad i = 1,2 \cdots M$ —① • The output of each correlator is $r_j = \int_0^T r(t)\,\phi_j(t)\,dt$ —② Substituting for $r(t)$ from eqn ① $r_j = \int_0^T [s_i(t) + w(t)]\,\phi_j(t)\,dt$	2
		$r_j = \int_0^T s_i(t)\,\phi_j(t)\,dt + \int_0^T w(t)\,\phi_j(t)\,dt$ $r_j = s_{ij} + w_j \quad j = 1,2 \cdots N$ —③ Where s_{ij} is a deterministic quantity since the transmitted signal $s_i(t)$ is known and is given by $s_{ij} = \int_0^T s_i(t)\,\phi_j(t)\,dt$ —④ • The second component w_j is the sample value of a random variable w_j due to channel noise $w(t)$ as shown by.	2
		• The second component w_j is the sample value of a random variable w_j due to channel noise $w(t)$ as shown by. $w_j = \int_0^T w(t)\,\phi_j(t)\,dt$ —⑤ • The correlator outputs are $r_j = s_{ij} \quad j = 1,2 \cdots N$ —⑥	1

b Explain the Matched filter receiver. Obtain the expression for the impulse response of the Matched filter.



- $y_j(t)$ is defined by the convolution integral

$$y_j(t) = \int_{-\infty}^{\infty} x(\tau)\, h_j(t-\tau)\, d\tau \quad -(1)$$

- Set the impulse response as :

$$h_j(t) = \phi_j(T-t) \quad -(2)$$

Let $t = t - \tau$

$\therefore$ eqn (2) becomes $h_j(t-\tau) = \phi_j(T-(t-\tau))$

$$h_j(t-\tau) = \phi_j(T-t+\tau) \quad -(3)$$

eqn (3) in (1) we get the resulting filter output as

$$y_j(t) = \int_{-\infty}^{\infty} x(\tau)\, \phi_j(T-t+\tau)\, d\tau \quad -(4)$$

- Let this signal be sampled at $t = T$ eqn (4) then reduces to

$$y_j(T) = \int_{-\infty}^{\infty} x(\tau)\, \phi_j(\tau)\, d\tau \quad -(5)$$

- WKT $\phi_j(T)$ is zero outside the interval $0 \le t \le T$
- The eqn (5) can be rewritten as

$$y_j(T) = \int_{0}^{T} x(\tau)\, \phi_j(\tau)\, d\tau \quad -(6)$$

$$y_j(T) = x_j \quad -(7)$$

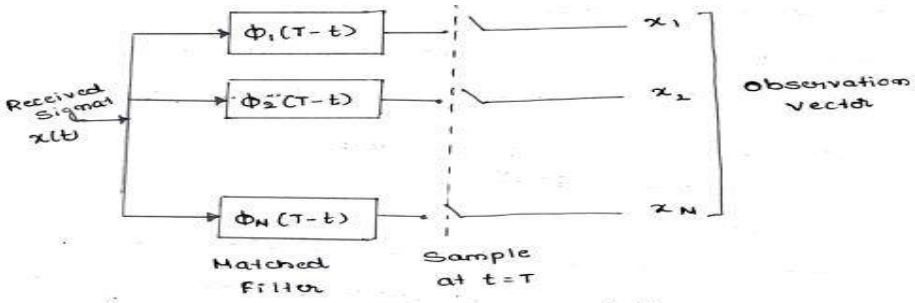
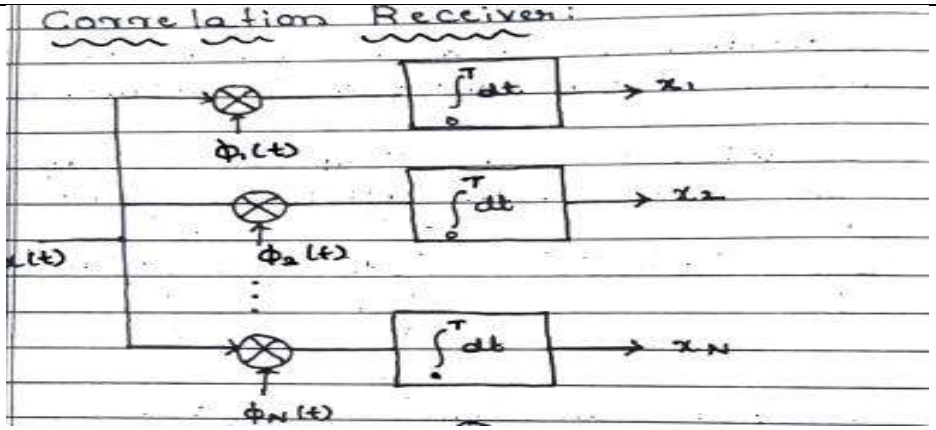
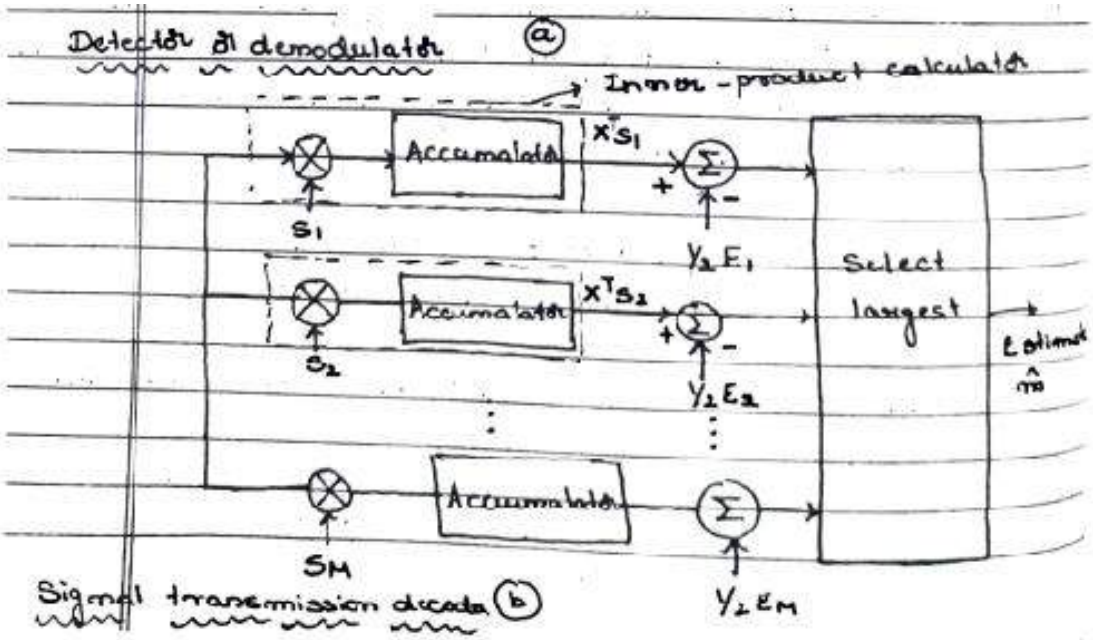


Fig. Detector part of Matched filter

" A Filter whose impulse response is a time reversed & delayed version of some signal $\phi_j(t)$. is said to be matched to $\phi_j(t)$."

2 a	Explain the Correlation receiver with neat diagram and explanation of detector and the Maximum – likelihood decoder blocks	4
		1.5
		1.5
	Explanation	1
b	Derive the statistical characterization of correlator outputs.	6
	• $w(t)$ is a Gaussian random process, the random process $x(t) = s_i(t) + w(t)$ is also Gaussian. It can be hence shown that each x_j is also Gaussian random variable.	

	1) Mean : $\mu_{xj} = E[x_j]$ where $x_j = s_{ij} + w_j$ $\mu_{xj} = E[s_{ij} + w_j]$ $\mu_{xj} = s_{ij} + E[w_j]$ $\boxed{\mu_{xj} = s_{ij}}$ — ①	2) Variance : $\sigma^2_{xj} = E[(x_j - \mu_{xj})^2]$ $\sigma^2_{xj} = E[(x_j - s_{ij})^2]$ where $x_j = s_{ij} + w_j$ $\boxed{\sigma^2_{xj} = E[(w_j)^2]}$ — ②	1 each
	$\sigma^2_{xj} = \frac{N_0}{2} \int_0^T \int_0^T \phi_j(t)\phi_j(u)\,\delta(t-u)\,dt\,du$ $\sigma^2_{xj} = \frac{N_0}{2} \int_0^T \phi_j^2(t)\,dt$ Since $\phi_j(t)$ have unit energy, by defination, the Expression for noise variance σ^2_{xj} reduce to $\boxed{\sigma^2_{xj} = \frac{N_0}{2} \text{ for all } j}$ — ③ $\sigma_{xj} = \sqrt{\frac{N_0}{2}}$	3) Covariance : $Cov[x_j x_k] = E[(x_j - \mu_{xj})(x_k - \mu_{xk})]$ — ④ x_j & x_k are mutually uncorrelated $Cov[x_j x_k] = E[(x_j - s_{ij})(x_k - s_{ik})]$ [∵ from eqn ①] $Cov[x_j x_k] = E[w_j w_k]$ — ⑤ with Reference to eqn ④, eqn ⑤ represented as $Cov[x_j x_k] = E\left[\int_0^T w(t)\phi_j(t)\,dt \int_0^T w(u)\phi_k(u)\,du\right]$ $= \frac{N_0}{2} \int_0^T \int_0^T \phi_j(t)\phi_k(u)\,\delta(t-u)\,dt\,du$ $= \frac{N_0}{2} \int_0^T \phi_j(t)\phi_k(u)\,dt$ $= 0, \quad j \neq k.$ $\boxed{Cov[x_j x_k] = 0, \quad j \neq k}$	2 each
3 a	Obtain the Maximum Likelihood Decision rule for the signal detection problem.		10
	• For an AWGN channel the received random process $x(t)$ is given by $x(t) = s_i(t) + w(t), \quad 0 \leq t \leq T, \quad i = 1, 2 \ldots M$ — ①		

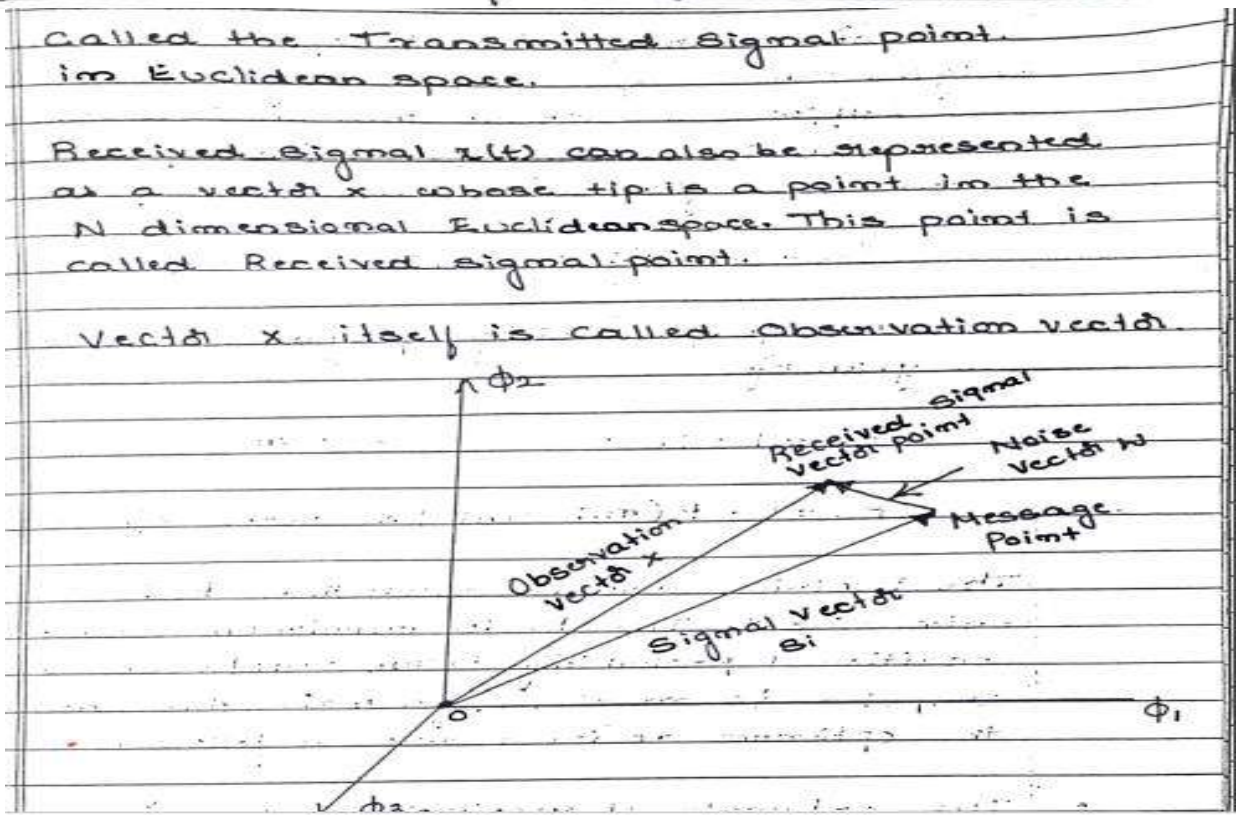
- where $w(t)$ is a sample function of white gaussian noise process $N(t)$, with zero mean and spectral density $N_0/2$.
- The receiver observes $x(t)$ and makes Estimate of signal $s_i(t)$ or message m_i
- The set of outputs of the correlators constitute a vector x:

$$x = s_i + w \quad \text{—(2)}$$

Vectors x and w are sample values of the random vectors X & W respectively.
s_i is a vector representing signal $s_i(t)$. The coordinates of this vector s_i is also called the Transmitted signal point in Euclidean space.

Received signal $x(t)$ can also be represented as a vector x whose tip is a point in the N dimensional Euclidean space. This point is called Received signal point.

Vector x itself is called observation vector.



Decision Rule

$$P_c = P(m_i \text{ sent} \mid x \text{ received}) \quad \text{—(3)}$$

The average probability of symbol error P_e is given by

$$P_e = 1 - P_c \quad \text{—(4)}$$

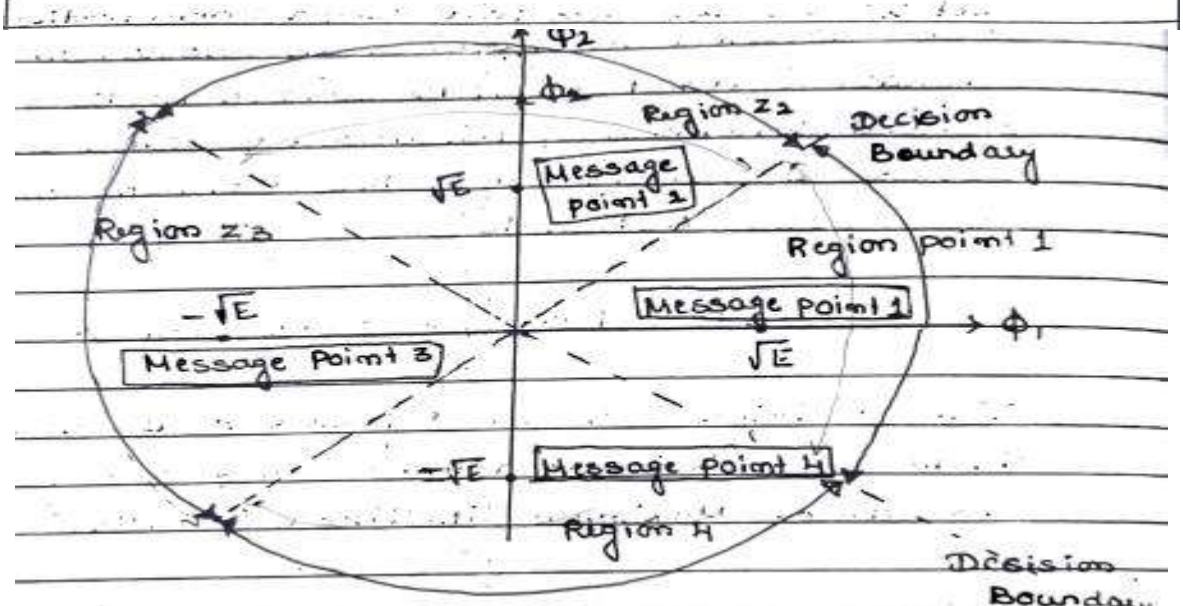
$$P_e = 1 - P(m_i \text{ sent} \mid x \text{ received}) \quad \text{—(5)}$$

The Estimate of received Symbol $\hat{m} = m_i$ if

$P(m_i \text{ Sent} \mid x \text{ received}) \geq P(m_k \text{ Sent} \mid x \text{ received})$

for all $k = 1, 2, \ldots, M$, $k \neq i$ —(6)

The above equation is called Maximum a posteriori probability and it can also be expressed in terms of likelihood function which leads to maximum likelihood receiver.



"Observation vector x lies in region z_i if $L(m_k)$ is maximum for $k = i$." —(1)

- The maximum likelihood decision rule for an AWGN channel is

"Observation vector x lies in region z_i if $\sum_{j=1}^{M} (x_j - s_{ij})^2$ is minimum for $k = i$" —(2)

"Observation vector x lies in region z_i if $\sum_{j=1}^{M} (x_j - s_{ij})^2$ is minimum for $k = i$" —(2')

$$\sum_{j=1}^{N} (x_j - s_{kj})^2 = \|x - s_k\|^2 \quad —(3)$$

"Observation vector x lies in region Z_i if Euclidean distance $\|x - s_k\|$ is minimum for $k=i$." — (4)

The decision rule is simplified by Expanding the summation on the left hand of eqn (3)

$$\sum_{j=1}^{N} (x_j - s_{kj})^2 = \underbrace{\sum_{j=1}^{N} x_j^2}_{①} - 2\underbrace{\sum_{j=1}^{N} x_j s_{kj}}_{②} + \underbrace{\sum_{j=1}^{N} s_{kj}^2}_{③} \quad — (5)$$

Accordingly we may reformulate the maximum likelihood decision rule one last time.

"Observation vector x lies in region Z_i if $\left(\sum_{j=1}^{N} x_j s_{kj} - \frac{1}{2} E_k\right)$ is maximum for $k=j$ where E_k is transmitted energy".

4 a	Show that for a noisy input the mean value of j^{th} correlator output Xj depends only on S_{ij} and all the correlators outputs Xj, j=1,2…..,N have a variance equal to the PSD $N_0/2$ of the additive noise process W(t).	7

- W(t) is a Gaussian random process, the random process $x(t) = s_i(t) + w(t)$ is also Gaussian. It can be hence shown that each x_j is also Gaussian random variable.

- Ensemble Averages for Random Variable x_j :

a) Mean :

$$\mu_{xj} = E[x_j]$$

where $x_j = s_{ij} + w_j$

$$\mu_{xj} = E[s_{ij} + w_j]$$

$$\mu_{xj} = s_{ij} + E[w_j] \qquad \because E[w_j] = 0$$

$$\boxed{\mu_{xj} = s_{ij}} \quad — (1)$$

b) Variance :

$$\sigma_{x_j}^2 = E[(x_j - \mu_{xj})^2]$$

$$\sigma_{x_j}^2 = E[(x_j - s_{ij})^2]$$

where $x_j = s_{ij} + w_j$

$$\boxed{\sigma_{x_j}^2 = E[(w_j)^2]} \quad — (2)$$

The Random variable w_j is defined by

$$w_j = \int_0^T w(t)\,\phi_j(t)\,dt \quad — (3)$$

1

∴ eqn ② expand as

$$\sigma_{x_j}^2 = E\int_0^T w(t)\,\phi_j(t)\,dt \int_0^T w(u)\,\phi_j(t)\,du$$

$$= E\left[\int_0^T\int_0^T \phi_j(t)\,\phi_j(u)\,w(t)\,w(u)\,dt\,du\right] \quad -④$$

Interchanging the order of integration & expectation

$$\sigma_{x_j}^2 = \int_0^T\int_0^T \phi_j(t)\,\phi_j(u)\,E[w(t)\,w(u)]\,dt\,du$$

$$\sigma_{x_j}^2 = \int_0^T\int_0^T \phi_j(t)\,\phi_j(u)\,R_w(t,u)\,dt\,du \quad -⑤$$

Where $R_w(t,u)$ is the auto correlation function of the noise process $w(t)$. Power spectral density of $w(t)$ is $N_0/2$.

$$\therefore R_w(t,u) = \frac{N_0}{2}\,\delta(t-u) \quad -⑥$$

Substituting ⑥ in ⑤ and then using the shifting property of the delta function $\delta(t)$ we get

$$\sigma_{x_j}^2 = \frac{N_0}{2}\int_0^T\int_0^T \phi_j(t)\,\phi_j(u)\,\delta(t-u)\,dt\,du$$

$$\sigma_{x_j}^2 = \frac{N_0}{2}\int_0^T \phi_j^2(t)\,dt$$

Since $\phi_j(t)$ have unit energy, by defination, the Expression for noise variance $\sigma_{x_j}^2$ reduce to

$$\boxed{\sigma_{x_j}^2 = \frac{N_0}{2} \quad \text{for all } j} \quad -⑦ \qquad \sigma_{x_j} = \sqrt{\frac{N_0}{2}}$$

The Correlator out denoted by x_j with $j = 1, 2 \cdots N$ have a variance equal to the power spectral density $N_0/2$ of the noise process $w(t)$.

2

2

	3) Covariance : $Cov[x_j x_k] = E[(x_j - \mu_{xj})(x_k - \mu_{xk})]$ — (8) x_j & x_k are mutually uncorrelated $Cov[x_j x_k] = E[(x_j - s_{ij})(x_k - s_{ik})]$ [∵ from eqn (1)] $Cov[x_j x_k] = E[w_j w_k]$ — (9) with Refernce to eqn (8), eqn (9) represented as $Cov[x_j x_k] = E\left[\int_0^T w(t)\phi_j(t)dt \int_0^T w(u)\phi_k(u)du\right]$ $= \left[\int_0^T \int_0^T \phi_j(t)\phi_k(u) E[w(t)w(u)]\,dt\,du\right]$ $Cov[x_j x_k] = \int_0^T \int_0^T \phi_j(t)\phi_k(u) R_w(t,u)\,dt\,du$ $= \frac{N_0}{2} \int_0^T \int_0^T \phi_j(t)\phi_k(u)\delta(t-u)\,dt\,du$ $= \frac{N_0}{2} \int_0^T \phi_j(t)\phi_k(u)\,dt$ $= 0 \quad , \quad j \neq k.$ $\boxed{Cov[x_j x_k] = 0 \quad , \quad j \neq k}$	2
4 b	Write brief note on OQPSK	3
	• The two basis functions of offset QPSK are defined by $\phi_1(t) = \sqrt{\frac{2}{T}}\cos(2\pi f_c t), \quad 0 \le t \le T$ & $\phi_2(t) = \sqrt{\frac{2}{T}}\sin(2\pi f_c t), \quad \frac{T}{2} \le t \le \frac{3T}{2}$ • The OQPSK has exactly the same probability of symbol error in an AWGN channel as QPSK. • Signal space diagram. (a) QPSK (b) OQPSK	1 2
5 a	Describe QPSK signal with its signal space diagram? With the help of a block diagram, Explain the QPSK Generation and Detection technique.	7
	Transmitted S/L $s_i(t) = \sqrt{\frac{2E}{T}}\cos[2\pi f_c t + (2i-1)\pi/4] \quad \begin{cases} 0 \le t \le T \\ i = 1,2,3,4 \end{cases}$ — (1)	

$$s_i(t) = \sqrt{\frac{2E}{T}} \cos\left[(2i-1)\frac{\pi}{4}\right] \cos(2\pi f_c t) - \sqrt{\frac{2E}{T}} \sin\left[(2i-1)\frac{\pi}{4}\right] \sin(2\pi f_c t)$$

where $i = 1, 2, 3, 4$

3

- Based on this representation we make two observation

There are two orthonormal basis functions, defined by a pair of quadrature carriers:

$$\phi_1(t) = \sqrt{\frac{2}{T}} \cos(2\pi f_c t), \quad 0 \le t \le T$$

$$\phi_2(t) = \sqrt{\frac{2}{T}} \sin(2\pi f_c t), \quad 0 \le t \le T$$

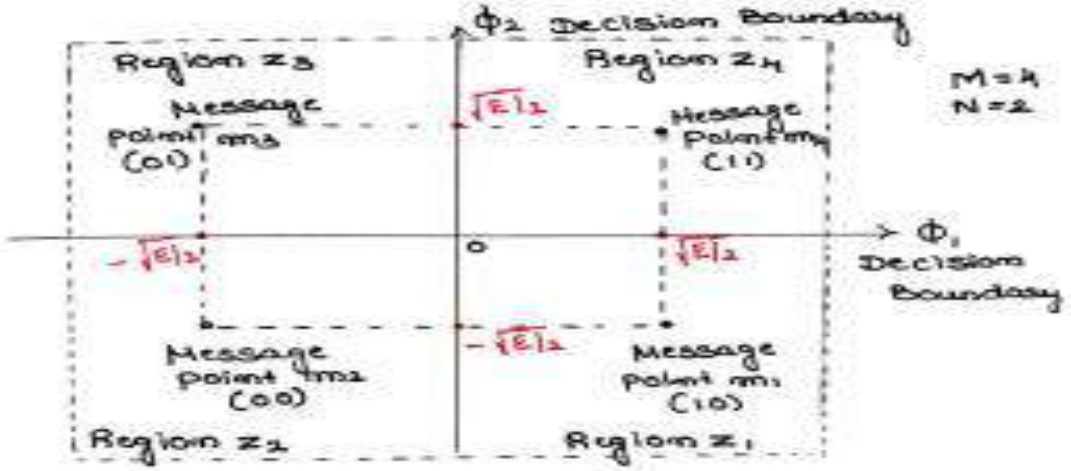


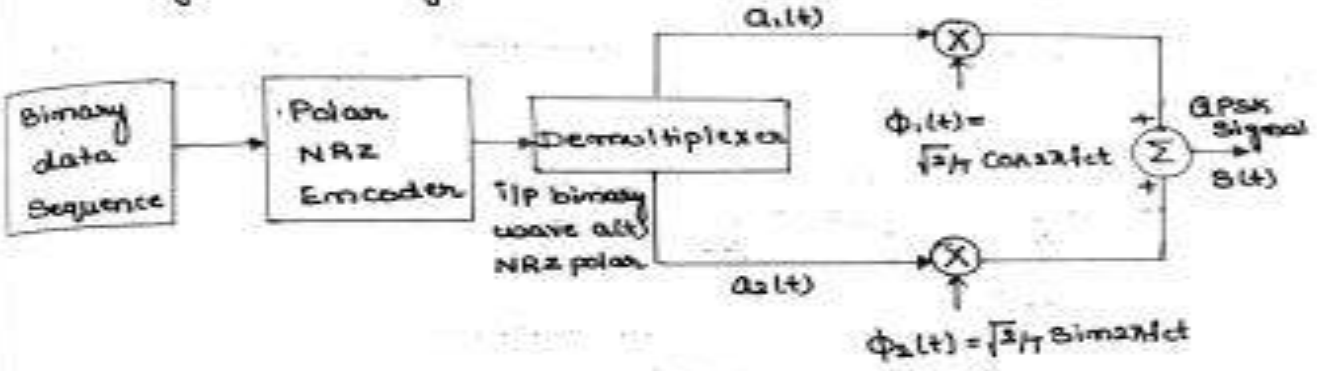
Fig: Signal-space diagram of QPSK System.

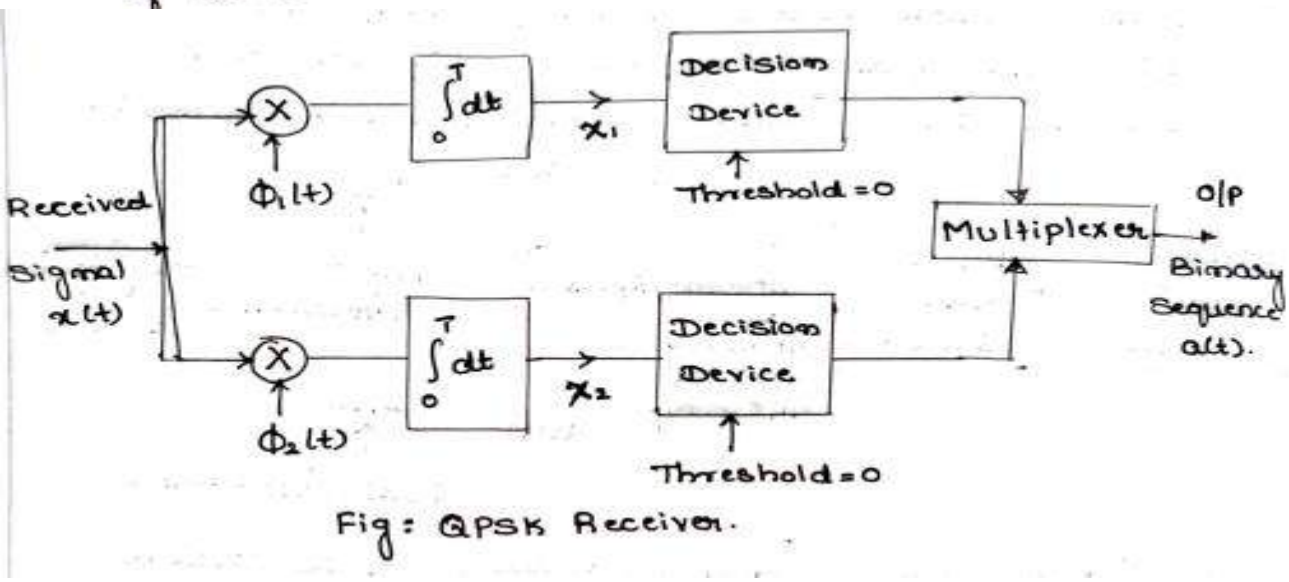
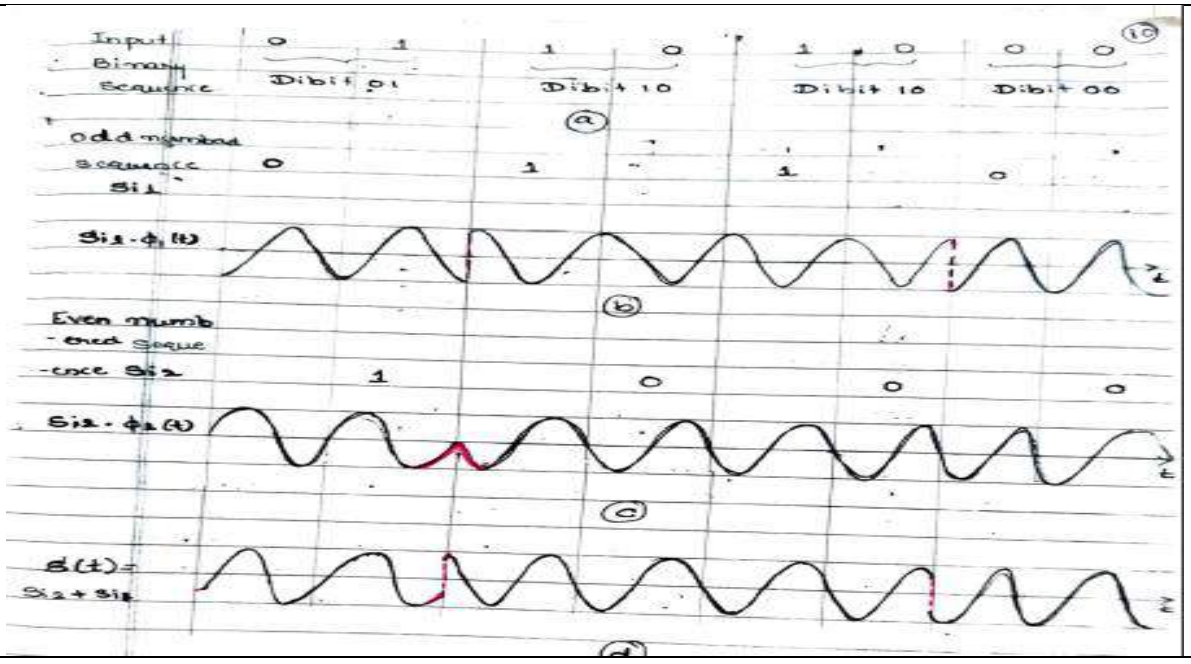
5. Generation of QPSK Signal

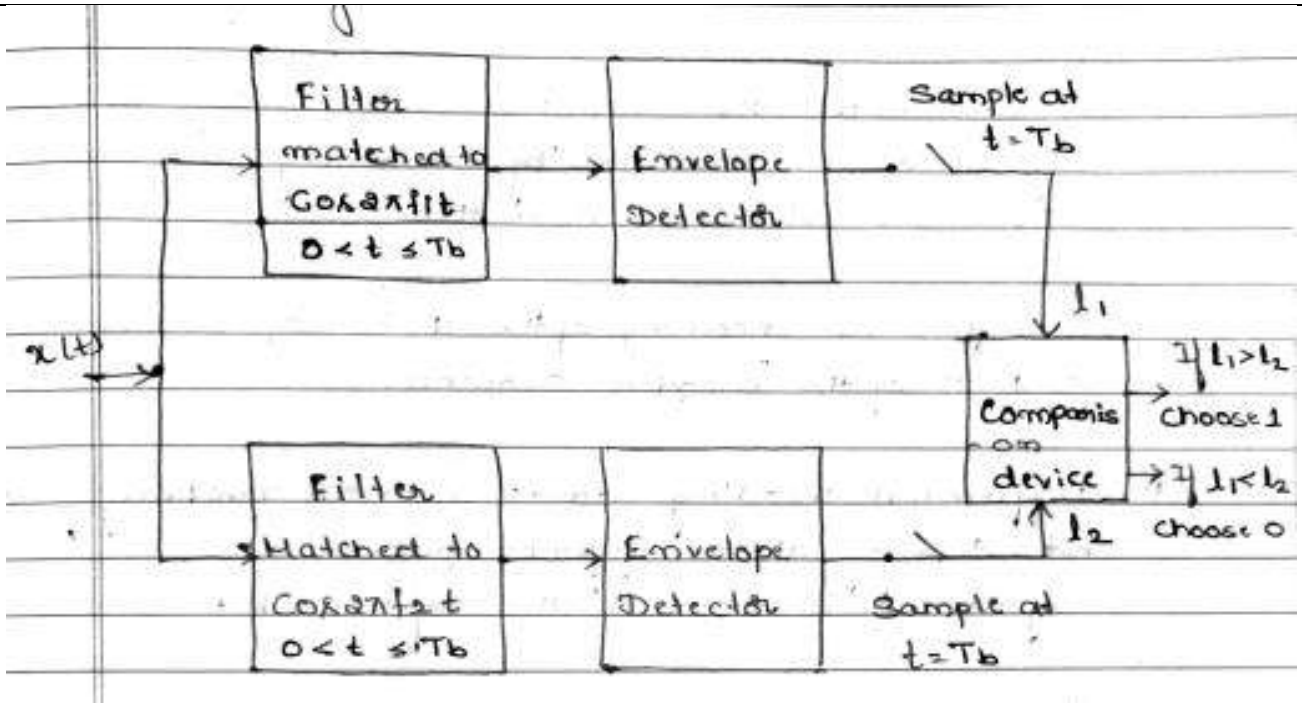
11

- The QPSK Transmitter may be viewed as two binary PSK generators that work in parallel, each at a bit rate equal to one half the bit rate of the original binary sequence at the QPSK transmitter i/p.

2



	4. QPSK Receiver: • The o/p of the two correlators are x_1 & x_2 which are compared with threshold value of '0' • If $x_1 > 0$, decision device assign bit 1 If $x_1 < 0$, decision device assign bit 0 If $x_2 > 0$ decision device assign bit 1 If $x_2 < 0$ " " bit 0  Fig: QPSK Receiver.	2
5 b	Sketch the QPSK waveform for the sequence 01101000	3
	 	1 each
6 a	An FSK and DPSK system transmits binary data at the rate of 2 x 10^6 bits per second. During the course of transmission, AWGN of zero mean and two sided power spectral density 10^{-20}	5

	watts per hertz is added to the signal. The amplitude of the received sinusoidal wave for digit 0 or 1 is 1 microvolt. Find the average probability of symbol error assuming Non-coherent detection.	
	Given: N0/2=10^{-20} = 2x10^{-20} **Ac= 1 micro Volts** **Rb=2x10^{6}; Tb = 0.5 x 10^{-6}** **FSK:** $Pe = \frac{1}{2} e^{(-Eb/2No)}$ **= 0.5$e^{(-Px\,0.5x10^{-6}/4x10^{-20})}$** **Where P=$Ac^2$ /2 = 0.5x10^{-12} w** **Pe = 0.5$e^{(-0.5x10-12x\,0.5x10^{-6}/4x10^{-20})}$ =0.5x0.00193=0.000965=<u>9.65x10^{-4}</u>** **DPSK:** $Pe = \frac{1}{2} e^{(-Eb)No)}$ **Pe = 0.5$e^{(-0.5x10-12x\,0.5x10^{-6}/2x10^{-20})}$ = <u>1.86x10^{-6}</u>**	2.5 Each
6 b	With a neat block diagram explain the Non Coherent detection of binary frequency shift keying technique	5
	 **Explanation**	2.5 2.5
7 a	Derive the expression for the probability of error for a binary FSK (Frequency Shift Keying) Using coherent detection.	6

Probability of Error for BFSK:

Consider the FSK wave at the receiver end

$$x(t) = s(t) + w(t) \quad -①$$

$s(t)$: FSK wave

$w(t)$: AWGN with $(\mu=0)$ & $(\sigma^2 = N_0/2)$

eqn ① can be rewritten as

$$x(t) = \begin{cases} s_1(t) + w(t) \rightarrow \text{Symbol '1'} \\ s_2(t) + w(t) \rightarrow \text{Symbol '0'} \end{cases}$$

- If Symbol '0' is assumed to be transmitted then the o/p of the correlator is $\boxed{x(t) = s_2(t) + w(t)}$

Since we have two correlators the o/p from the (

Top correlator is given by.

$$X_1 = \int_0^{T_b} x(t)\,\phi_1(t)\,dt$$

$$X_1 = \int_0^{T_b} (s_2(t) + w(t))\,\phi_1(t)\,dt$$

$$= \int_0^{T_b} s_2(t)\,\phi_1(t)\,dt + \int_0^{T_b} w(t)\,\phi_1(t)\,dt$$

$$X_1 = S_{21} + W_1$$

$$X_1 = 0 + W_1$$

Mean $E[X_1] = E[W_1] = 0$; $\boxed{\mu_{X_1} = 0}$

Variance of X_1 is

$$\text{Var}[X_1] = \text{Var}[0 + W_1]$$

$$\boxed{\text{Var}[X_1] = N_0/2}$$

III^{ly} the o/p of the bottom correlator is given by

$$X_2 = \int_0^{T_b} x(t)\,\phi_2(t)\,dt$$

$$X_2 = \int_0^{T_b} [s_2(t) + w(t)]\,\phi_2(t)\,dt$$

$$X_2 = \int_0^{T_b} s_2(t)\,\phi_2(t)\,dt + \int_0^{T_b} w(t)\,\phi_2(t)\,dt$$

$$X_2 = S_{22} + W_2$$

Mean of X_2

$$E[X_2] = E[S_{22}] + E[W_2]$$

$$E[X_2] = \sqrt{E_b} + 0 = \sqrt{E_b}$$

$$\boxed{\mu_{X_2} = \sqrt{E_b}}$$

Variance of X_2

$$\text{Var}[X_2] = \text{Var}[S_{22}] + \text{Var}[W_2]$$

$$\boxed{\text{Var}[X_2] = N_0/2}$$

From the BFSK receiver model block diagram, we have

$$I = X_1 - X_2$$

Mean: $E[I] = E[X_1 - X_2] = E[X_1] - E[X_2] = 0 - \sqrt{E_b}$

$$E[I] = -\sqrt{E_b}$$

$$\boxed{\mu_I = -\sqrt{E_b}}$$

Since X_1 & X_2 are statistically independent of each other w.r.t variance

$$\text{Var}[I] = \text{Var}[X_1] + \text{Var}[X_2] = \frac{N_0}{2} + \frac{N_0}{2}$$

$$\boxed{\text{Var}[I] = N_0}$$

The Conditional probability density function when Symbol '0' is transmitted is given by

$$f_L(l|0) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(l-\mu_L)^2}{2\sigma^2}}$$

$$f_L(l|0) = \frac{1}{\sqrt{2\pi N_0}} e^{-\frac{(l+\sqrt{E_b})^2}{2N_0}}$$

Where $E[l] = \mu_L = -\sqrt{E_b}$, $\sigma_L^2 = N_0/2$

$$f_L(l|0) = \frac{1}{\sqrt{2\pi N_0}} e^{-\left(\frac{l+\sqrt{E_b}}{\sqrt{2N_0}}\right)^2}$$

The probability of error when Symbol '0' is Txd but Symbol '1' is Rxd is given by

$$P_e(0) = \int_0^\infty f_L(l|0)\, dl$$

For Symbol 1 $\Rightarrow$ $0 < l < \infty$ $(0 < l < \sqrt{E_b})$

$$P_e(0) = \int_0^\infty \frac{1}{\sqrt{2\pi N_0}} e^{-\left(\frac{l+\sqrt{E_b}}{\sqrt{2N_0}}\right)^2} dl$$

Let $z = \frac{l+\sqrt{E_b}}{\sqrt{2N_0}}$

$dz = \frac{dl}{\sqrt{2N_0}}$

$\sqrt{2N_0}\, dz = dl$

Changing the limits

when $l = 0$, $z = \frac{0+\sqrt{E_b}}{\sqrt{2N_0}} = \sqrt{\frac{E_b}{2N_0}}$

when $l = \infty$, $z = \frac{\infty+\sqrt{E_b}}{\sqrt{2N_0}} = \sqrt{\frac{E_b}{2N_0}}$

$$P_e(0) = \int_{\sqrt{\frac{E_b}{2N_0}}}^\infty \frac{1}{\sqrt{2\pi N_0}} e^{-(z)^2} dz \cdot \sqrt{2N_0}$$

$$P_e(0) = \int_{\sqrt{E_b/2N_0}}^\infty \frac{1}{\sqrt{\pi}} e^{-z^2} dz$$

Multiply & divide by 2

$$P_e(0) = \frac{2}{2\sqrt{\pi}} \int_{\sqrt{E_b/2N_0}}^\infty e^{-z^2} dz$$

WKT Complementary error function is given by

$$\text{erfc}(u) = \frac{2}{\sqrt{\pi}} \int_u^\infty e^{-u^2} du$$

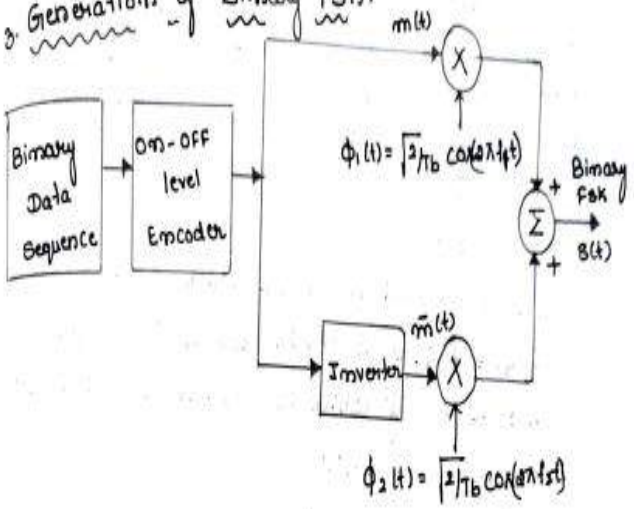
Comparing $P_e(0)$ & erfc(u) eqn we have

$$P_e(0) = \frac{1}{2}\,\text{erfc}\sqrt{\frac{E_b}{2N_0}}$$

where $z = \sqrt{\frac{E_b}{2N_0}}$

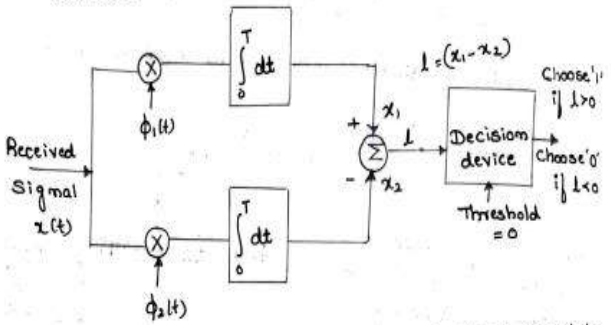
7 b Explain BFSK system with the help of Transmitter and Receiver. **4**

3. Generation of Binary FSK:



Explanation

4. Detection of BFSK:



x(t) is the received signal which is cross correlated with $\phi_1(t)$ & $\phi_2(t)$ to obtain x_1 & x_2. The difference of x_1 & x_2 is 'l' which is fed into decision device

if $l > 0$ → Symbol '1'

if $l < 0$ → Symbol '0'

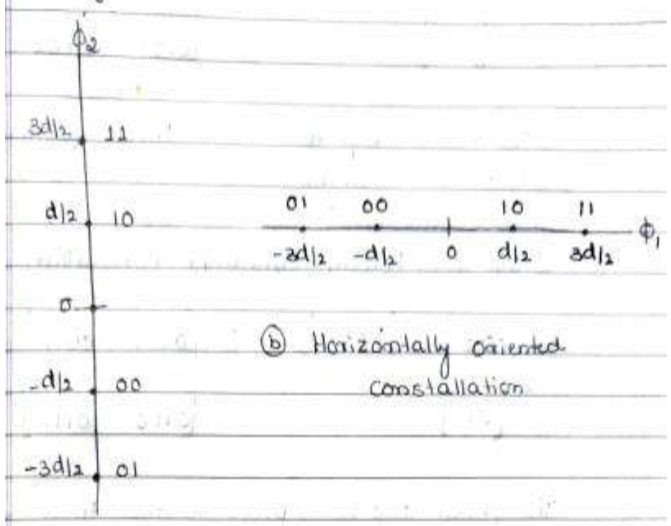
Explanation

2 Each

8 a	Obtain the Constallation of QAM for M=16 and draw the siganl space diagram	4

$$S_m(t) = \sqrt{\frac{2E_0}{T}}\, a_k \cos(\omega_c t) - \sqrt{\frac{2E_0}{T}}\, b_k \sin\omega_c t, \quad \begin{cases} 0 \le t \le T \\ k = 0, \pm 1, \pm 2 \end{cases}$$

The two orthogonal constallations of the M ary PAM



ⓐ Vertically oriented constallation

ⓑ Horizontally oriented constallation

Stage 1: First Quadrant Constallation

$$\begin{bmatrix} 11 \\ 10 \end{bmatrix} \quad [10\ 11] \longrightarrow \begin{bmatrix} 1110 & 1111 \\ 1010 & 1011 \end{bmatrix}$$

Top to bottom, Left to right, First Quadrant.

Stage 2: Second Quadrant Constallation

$$\begin{bmatrix} 11 \\ 10 \end{bmatrix} \quad [01\ 00] \longrightarrow \begin{bmatrix} 1101 & 1100 \\ 1001 & 1000 \end{bmatrix}$$

Top to bottom, Left to right, Second Quadrant.

Stage 3: Third Quadrant Constallation

$$\begin{bmatrix} 00 \\ 01 \end{bmatrix} \quad [01\ 00] \longrightarrow \begin{bmatrix} 0001 & 0000 \\ 0101 & 0100 \end{bmatrix}$$

Top to bottom, Left to right, Third quadrant

Stage 4: Fourth Quadrant Constallation

$$\begin{bmatrix} 00 \\ 01 \end{bmatrix} \quad [10\ 11] \longrightarrow \begin{bmatrix} 0010 & 0011 \\ 0110 & 0111 \end{bmatrix}$$

2 Each

The final step is to piece together these four constituent M ary PAM Constallations to construct the M ary QAM. Constallations.

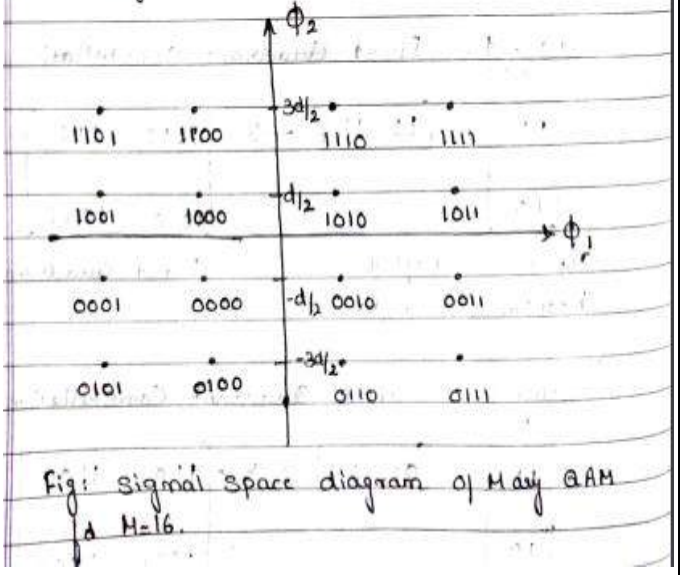
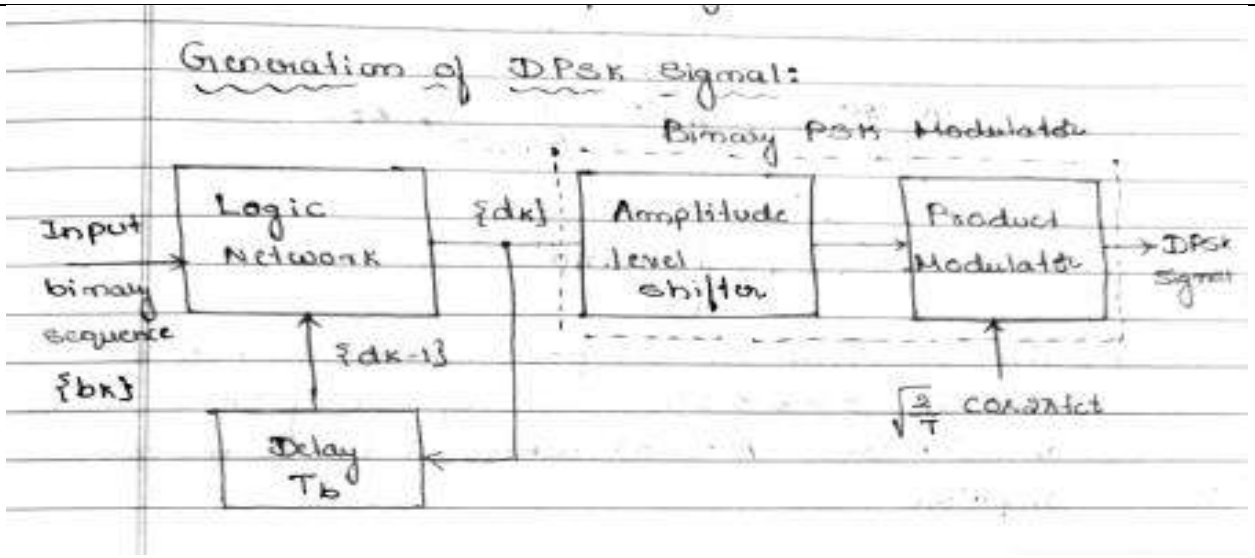


Fig: Signal Space diagram of M ary QAM for M=16.

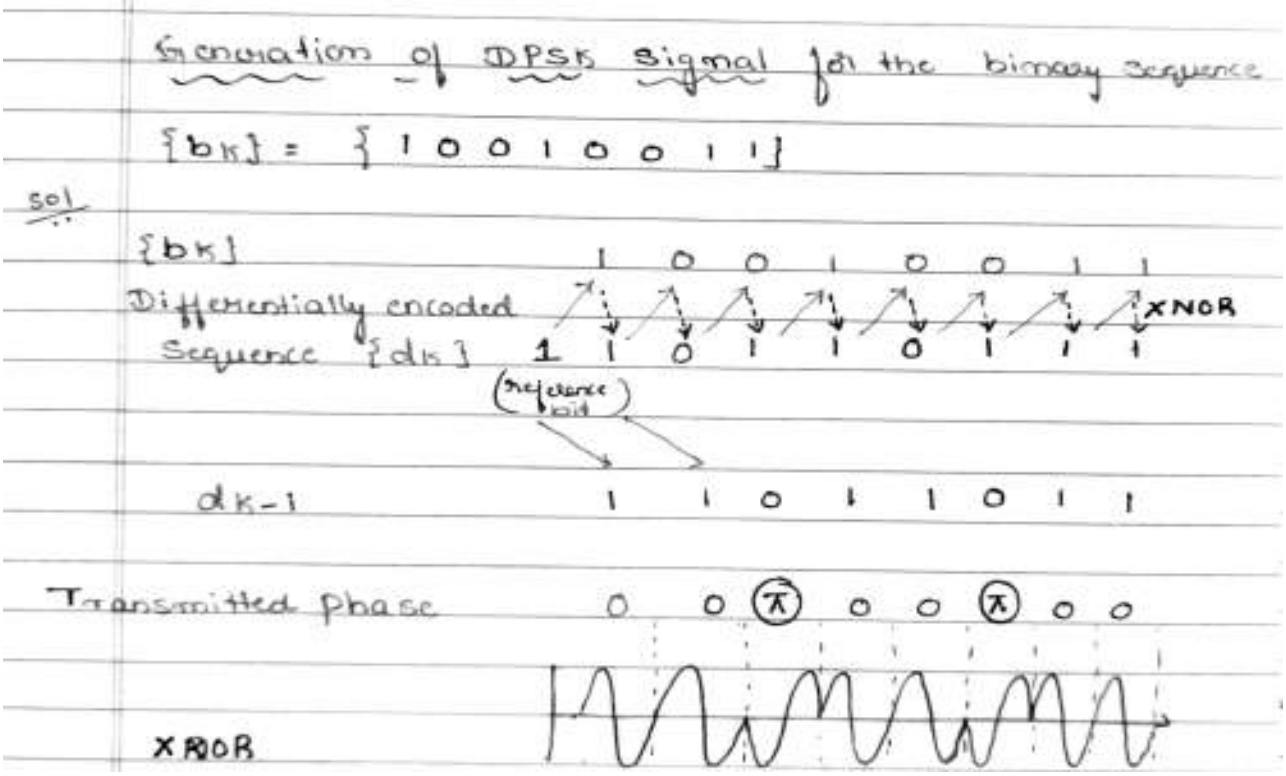
8 b	Draw the block diagram of DPSK transmitter and explan for the binary sequence 1001000110, find the resulting wave form for DPSK system.	



2

Explanation

1



3

9 a	Derive the expression for the probability of error for a binary PSK (Phase Shift Keying) Using coherent detection.	7

5) Probability of Error Calculation (P_e):

- The decision region associated with symbol 1 or signal $s_1(t)$ is described by

$$Z_1 : 0 < x_1 < \infty$$

where the observable element x_1 is related to the received signal $x(t)$ by

$$x_1 = \int_0^{T_b} x(t)\,\phi_1(t)\,dt \quad -(8)$$

- The received signal $x(t)$ in the presence of AWGN $w(t)$ with the assumption that symbol '0' or $s_2(t)$ is Transmitted is given by

$$x(t) = s_2(t) + w(t) \;;\; 0 \le t \le T_b$$

$$x_1 = \int_0^{T_b} x(t)\,\phi_1(t)\,dt = \int_0^{T_b} [s_2(t) + w(t)]\,\phi_1(t)\,dt$$

$$= \int_0^{T_b} s_2(t)\,\phi_1(t)\,dt + \int_0^{T_b} w(t)\,\phi_1(t)\,dt$$

$$\boxed{x_1 = s_{21} + w_1} \quad -(9)$$

Since $s_{21} = -\sqrt{E_b}$

$$\boxed{x_1 = -\sqrt{E_b} + w_1} \quad -(10)$$

Mean: μ_{x1}

$E[x_1] = E[-\sqrt{E_b}] + E[w_1]$

$E[x_1] = E[-\sqrt{E_b}] + 0$

$\mu_{x1} = E[x_1] = -\sqrt{E_b}$

Variance: σ_{x1}^2

$\text{Var}[x_1] = \text{Var}[-\sqrt{E_b} + w_1]$

$\text{Var}[x_1] = \text{Var}[-\sqrt{E_b}] + \text{Var}[w_1]$

$\text{Var}[x_1] = \text{Var}[w_1] = N_0/2$

We have $\mu_{x_1} = -\sqrt{E_b}$ & variance $\sigma_{x_1}^2 = N_0/2$

- The condition probability Density function of random variable x_1 given that Symbol '0' is transmitted is given by

$$f_{X_1}(x_1|0) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left[-\frac{(x_1 - \mu_{x1})^2}{2\sigma^2}\right] = \frac{1}{\sqrt{2\pi(N_0/2)}} \exp\left[-\frac{(x_1 - (-\sqrt{E_b}))^2}{2N_0/2}\right]$$

where $\mu_{x1} = -\sqrt{E_b}$; $\sigma^2 = N_0/2$;

$$f_{X_1}(x_1|0) = \frac{1}{\sqrt{\pi N_0}} \exp\left[-\frac{(x_1 + \sqrt{E_b})^2}{N_0}\right] \quad -(11)$$

- When symbol '0' is Transmitted an error will occur if $x_1 > 0$ (i.e.) x_1 lies in the region z_1 in which case a decision is made in favour of symbol 1.

$$P_e(0) = P(x_1 > 0 \mid \text{symbol 0 is Transmitted})$$

- $P_e(0)$ can be computed by integrating conditional probability density function $f_{x_1}(x_1|0)$ as

$$P_e(0) = \int_0^\infty f_{x_1}(x_1|0)\, dx_1 \quad -(12)$$

eqn (11) in (12)

$$P_e(0) = \frac{1}{\sqrt{\pi N_0}} \int_0^\infty \exp\left[-\left(\frac{x_1 + \sqrt{E_b}}{\sqrt{N_0}}\right)^2\right] dx_1$$

Let $\frac{x_1 + \sqrt{E_b}}{\sqrt{N_0}} = u$

$x_1 + \sqrt{E_b} = \sqrt{N_0}\, u$

$dx_1 = \sqrt{N_0}\, du$

If $x_1 = 0$ $\quad u = \sqrt{E_b/N_0}$

If $x_1 = \infty$ $\quad u = \infty$

$0 + \sqrt{E_b} = \sqrt{N_0}\, u$

$u = \sqrt{E_b/N_0}$ at '0'

$\infty + \sqrt{E_b} = \sqrt{N_0}\, u$

$u = \infty$

$$P_e(0) = \frac{1}{\sqrt{\pi N_0}} \int_{\sqrt{E_b/N_0}}^\infty \exp(-u^2)\, du \cdot \sqrt{N_0}$$

$$P_e(0) = \frac{\sqrt{N_0}}{\sqrt{\pi N_0}} \int_{\sqrt{E_b/N_0}}^\infty \exp(-u^2)\, du = \frac{1}{\sqrt{\pi}} \int_{\sqrt{E_b/N_0}}^\infty \exp(-u^2)\, du$$

$$\boxed{P_e(0) = \frac{1}{\sqrt{\pi}} \int_{\sqrt{E_b/N_0}}^\infty \exp(-u^2)\, du} \quad -(13)$$

$P_e(0)$ can be expressed in terms of Complementary error function denoted by "erfc"

where $\operatorname{erfc}(u) = \frac{2}{\sqrt{\pi}} \int_u^\infty e^{-u^2}\, du \quad -(14)$

Comparing eqn (14) & (13) find the similarities.

Multiply & ÷ by (6) by 2

$$P_e(0) = \frac{2}{2\sqrt{\pi}} \int_{\sqrt{E_b/N_0}}^\infty \exp(-u^2)\, du$$

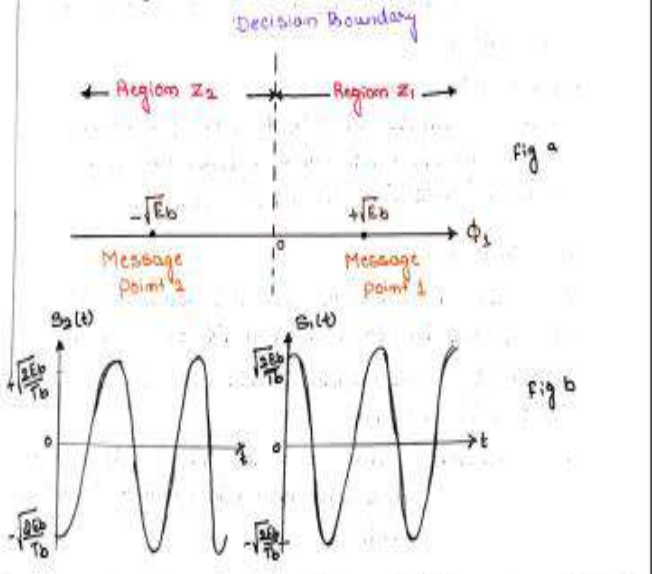
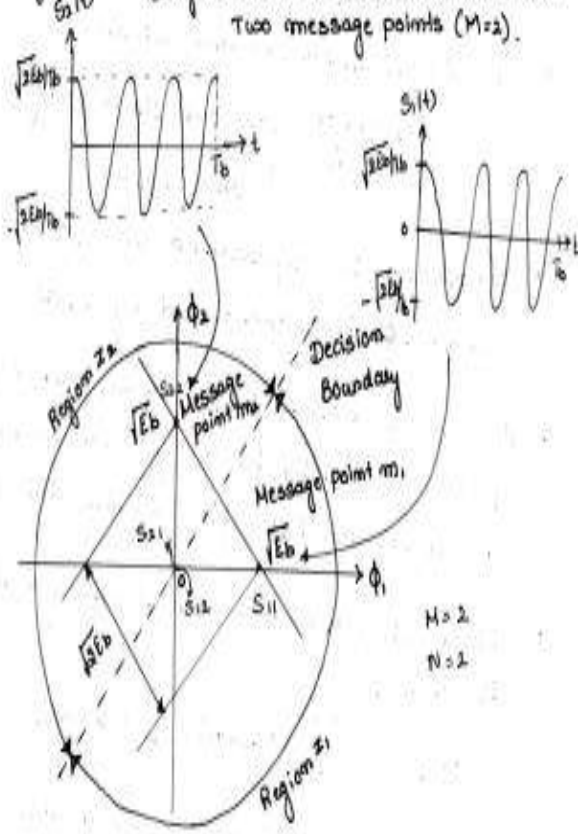
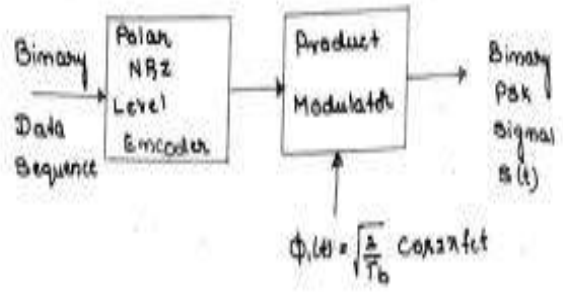
$$P_e(0) = \frac{1}{2} \operatorname{erfc}(u)$$

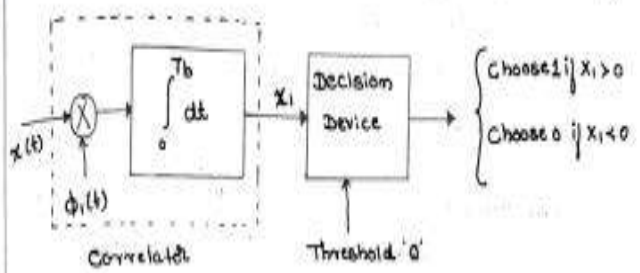
where $u = \sqrt{\frac{E_b}{N_0}}$ at $x_1 = 0$

$$\therefore \boxed{P_e(0) = \frac{1}{2} \operatorname{erfc}\left(\sqrt{\frac{E_b}{N_0}}\right)}$$

Similarly

$$\boxed{P_e(1) = \frac{1}{2} \operatorname{erfc}\left(\sqrt{\frac{E_b}{N_0}}\right)}$$

9 b	Draw signal space diagram form BPSK and BFSK	
	A Binary PSK System is characterized by having a signal space that is one dimensional with signal constellation of two message point (M=2). The respective coordinates of the two message points are. $s_{11} = \int_0^{T_b} s_1(t)\,\phi_1(t)\,dt = +\sqrt{E_b}$ — ① $s_{21} = \int_0^{T_b} s_2(t)\,\phi_1(t)\,dt = -\sqrt{E_b}$ — ②  a. Signal space diagram for coherent Binary PSK System b. The waveforms depicting the Transmitted Signals $s_1(t)$ & $s_2(t)$.	2. Signal space diagram of BFSK: Fig. Signal space diagram for Binary FSK System. Binary FSK is characterized having a signal space diagram that is two dimensional with Two message points (M=2). 
10 a	Explain BPSK system with the help of Transmitter and Receiver.	7
	1. Representation of BPSK The Signal $s_1(t)$ & $s_2(t)$ are used to represent binary symbol 1 and 0 $s_1(t) = \sqrt{\frac{2E_b}{T_b}}\cos 2\pi f_c t$, $0 \le t \le T_b$ ⇒ Symbol '1' — ① $s_2(t) = \sqrt{\frac{2E_b}{T_b}}\cos(2\pi f_c t + \pi)$, $0 \le t \le T_b$ ⇒ Symbol '0' — ② T_b: Symbol interval E_b: Transmitted Signal energy bit. $f_c \gg \frac{1}{T_b}$	3) Generation of Binary PSK.  **Explanation**	1 2.5 2.5

	4) Detection To make an optimum decision on the received signal $x(t)$ in favour of symbol '1' or symbol '0' two basic components in the binary PSK receiver is required. • Correlator: which correlates the received signal $x(t)$ with the basis function $\phi_1(t)$ over a bit • Decision Device: which compares the correlator output against a zero threshold assuming that binary symbols 1 and 0 are equiprobable. Decision conditions: If $x_1 > 0 \Rightarrow$ Symbol '1' If $x_1 < 0 \Rightarrow$ Symbol '0'	4  	2
10 b	Define Bandwidth efficiency. Tabulate and comment on bandwidth effiiency of M ary PSK signal for different values of M.		3
	Channel Bandwidth required to pass M-ary PSK signals through an analog channel $B = \frac{2}{T}$ T: Symbol duration. $T_b = \frac{\text{no of bits}}{\text{Symbol}} \times \text{bit duration}$ Bit rate R_b: $R_b = \frac{1}{T_b}$	$\therefore B = \frac{2}{\left(\frac{\text{no of bits}}{\text{Symbol}}\right) \times \text{bit duration}}$ $B = \frac{2}{n \times T_b}$ where $n = \log_2 M$. $\therefore B = \frac{2}{\log_2 M \times \frac{1}{R_b}}$ $B = \frac{2R_b}{\log_2 M}$	1.5 Each

1	R	N								

R N S INSTITUTE OF TECHNOLOGY
Department of Electronics & Communication Engineering
Vision: Conquering technical frontiers in the field of Electronics & Communication.

III – Internal Assessment

SEM: **VI (A, B, C, D)**
Subject: **Digital Communication**
Sub. Code: **18EC61**

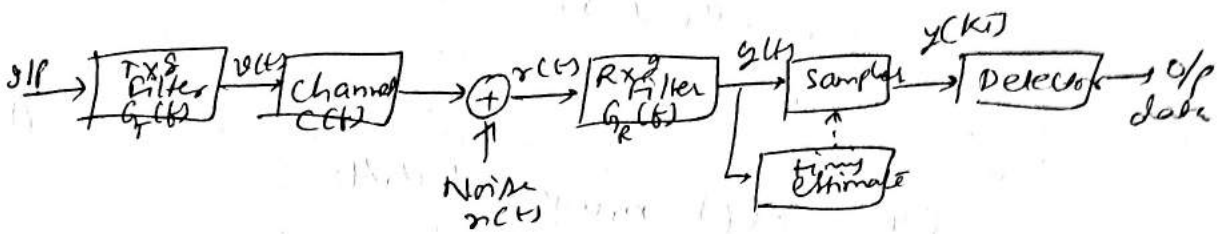
Date: 7/07/2022
Duration: 1 hr. 30 mins
Max. Marks: 50

Q. No.		Questions	Marks	COs	BCL
1	a	With a neat block diagram explain the digital PAM transmission through bandlimited baseband channels and obtain the expression for ISI.	6	CO4	L2
	b	What is eye pattern? Draw the diagram showing effect of ISI on eye opening and list out the information inferred from the eye diagram.	4		L1
		OR			
2	a	What is Nyquist criterion for zero ISI? Give an example of the pulse with zero ISI. Draw the relevant waveform.	5	CO4	L2
	b	Obtain the expression for SNR of digital transmission through bandlimited channel.	5		L2
3	a	Explain the design of band limited signals with controlled ISI using Duo binary signal.	6	CO4	L2
	b	Explain modified duobinary controlled ISI with relevant expressions and waveforms	4		L2
		OR			
4	a	Explain the method for symbol detection with controlled ISI.	4	CO4	L2
	b	Consider the four level data sequence 0013120332010 which is the input to the precoder whose output is used to modulate a duobinary transmitting filter. Obtain the precoded sequence, transmitted amplitude levels, the received signal levels and the decoded sequence.	6		L3
5	a	What is channel equalization? With a neat block diagram explain the concept of equalization using a linear transversal filter	6	CO4	L2
	b	The binary sequence 10010110010 is the input to the precoder whose output is used to modulate a duobinary transmitting filter. Obtain the precoded sequence, transmitted amplitude levels, the received signal levels and the decoded sequence.	4		L3
		OR			
6	a	What are the benefits of using pulses having raised cosine spectrum in band limited channel.	3	CO4	L2
	b	Explain adaptive channel equalizer with relevant block diagram.	7		L2
7	a	Explain the model of a spread spectrum digital communication system.	5	CO5	L2
	b	Explain the generation of DSSS technique with relevant block diagram and waveform	5		L2
		OR			
8	a	With neat block diagram explain FHSS technique. Explain the term chip, chip rate and processing gain	6	CO5	L2
	b	Mention the application of DSSS. Explain any one briefly	4		L1
9	a	Explain with neat diagram the generation of PN sequence, Mention its properties	4	CO5	L2
	b	Draw the four stage linear feedback shift register with 1st and 4th stage connected to modulo 2 adder. Output of the modulo 2 adder is connected to 1st stage input. Find the output PN sequence. Consider initial state as 1000.	6		L3
		OR			
10	a	A slow frequency hopped / MFSK system has the following parameters: i) The number of bits / MFSK symbol =2 ii)The number of MFSK tones =4 (iii)Length of PN segment per hop =2 (iv)Total number of frequency hops = 4 Consider a binary input data 011100111101100000001 and PN sequence 0011011000. Draw the FH spectrum.	5	CO5	L3
	b	Explain with relevant block diagram IS- 95 forward link.	5		L2

*Bloom's Cognitive Levels: L1 – Remember, L2 – Understand, L3 – Apply, L4 – Analyze, L5 – Evaluate, L6 – Create.

III Internal
DC Scheme.

1a)



(2m)

- baseband signal : $v(t) = \sum_{n=-\infty}^{\infty} a_n g_T(t-nT)$

  channel o/p : $r(t) = \sum_{n=-\infty}^{\infty} a_n h(t-nT) + n(t)$

Rx'd signal at the o/p of filter

$$y(t) = \sum_{n=-b}^{b} a_n x(t-nT) + w(t)$$

Sampled $y(mT) = \sum_{n=-b}^{b} a_n x(mT-nT) + w(mT)$

$$y_m = x_0 a_m + \sum_{n \neq m} a_n x_{m-n} + w_m$$

($x_0 a_m$: desired symbol; $\sum_{n \neq m} a_n x_{m-n}$: ISI; w_m: noise)

(4m)

1(b) Eye diagram summarizes the effect of ISI by showing the response of 0's & 1's.

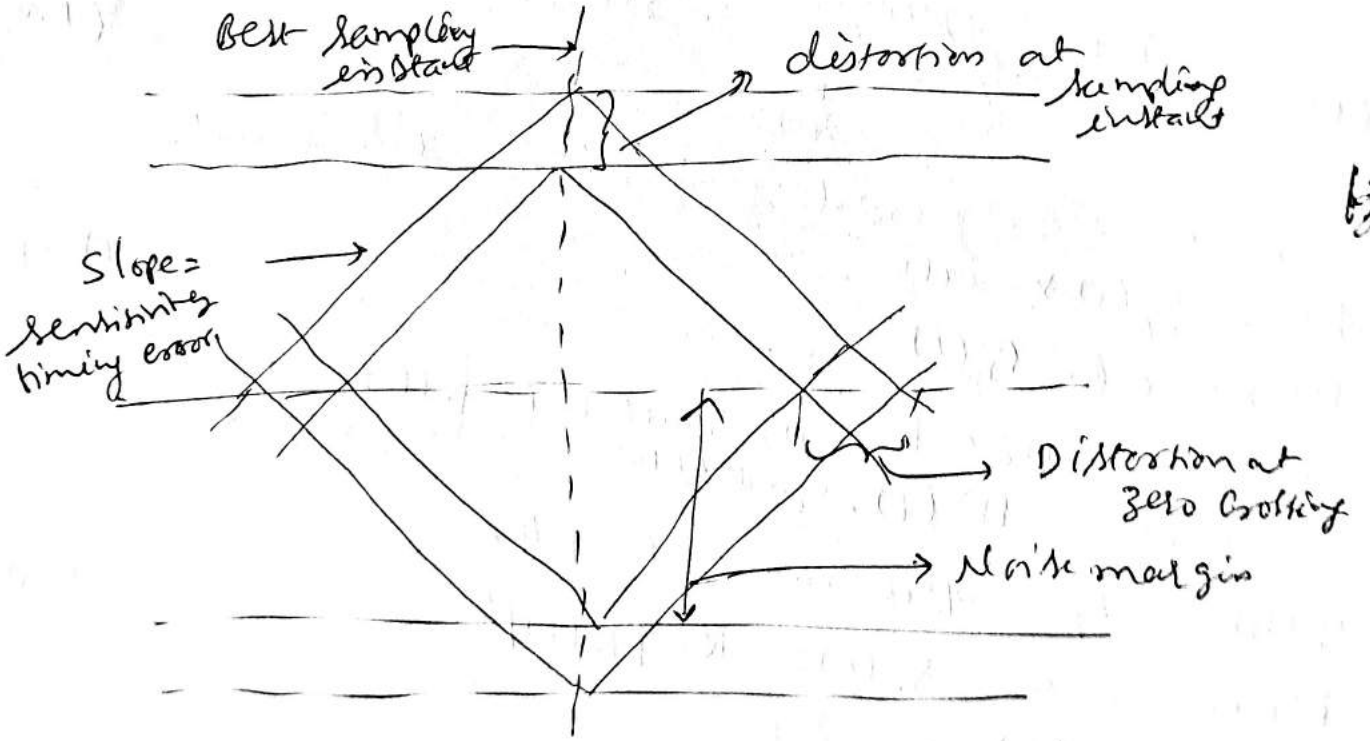


fig (2m) + (2m)

2a) Nyquist Condition for Zero ISI

$$x(t) = \begin{cases} 1, & n=0 \\ 0, & n \neq 0 \end{cases}$$ (1m)

is that its FT $X(f)$ must satisfy

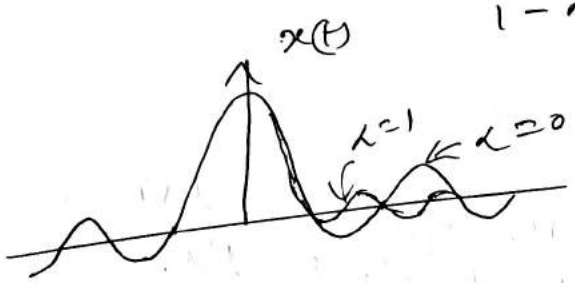
$$\sum_{m=-\infty}^{\infty} X\left(f + \frac{m}{T}\right) = T$$

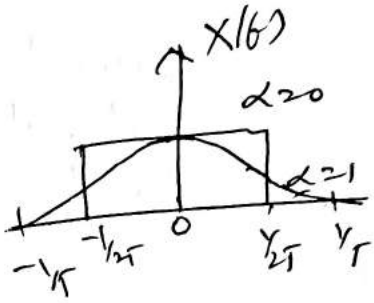
$\frac{1}{T} < 2W \rightarrow$ Raised cosine Spectrum.

Eg: $x(t)$ at

$$X_{rc}(f) = \begin{cases} T, & 0 \le |f| \le \frac{1-\alpha}{2T} \\ \frac{T}{2}\left[1 + \cos\left(\frac{\pi T}{\alpha}\left(|f| - \frac{1-\alpha}{2T}\right)\right)\right], & \frac{1-\alpha}{2T} \le |f| \le \frac{1+\alpha}{2T} \\ 0, & |f| > \frac{1+\alpha}{2T} \end{cases}$$ (2m)

$$x(t) = \text{sinc}(t/T)\,\frac{\cos(\pi\alpha t/T)}{1 - 4\alpha^2 t^2/T^2}$$





(2m)

2(b)



(1m)

Linear filter model of bandlimited channel.

$h(t) = g_T(t) * c(t)$

$H(f) = C(f)\,G_T(f)$ (2m)

$r(t)$ is passed through matched filter with freq response

$G_R(f) = H^*(f) \cdot e^{-j2\pi ft_0}$

$y_s(t_0) = E_h$ o/p of matched filter

PSD of noise $S_n(f) = \frac{N_0}{2}|H(f)|^2$ (3m)

$$SNR = \left(\frac{S}{N}\right)_0 = \frac{2E_h}{N_0}$$

3a) Bandlimited signal with Controlled ISI — Duobinary

$$x(nT) = \begin{cases} 1, & n = 0, 1 \\ 0, & \text{otherwise} \end{cases}$$

& $Z(f) = \sum_{m=-\infty}^{\infty} X\left(f + \frac{m}{T}\right) = \sum_{n=-\infty}^{\infty} z_n e^{j2\pi f_m nT}$

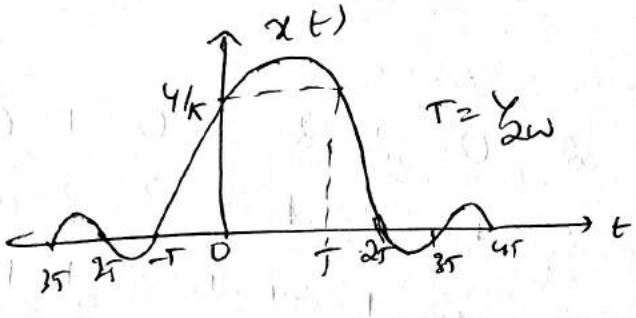
with FS expansion

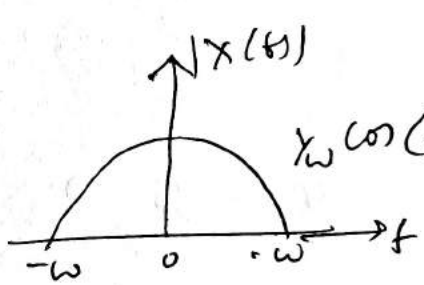
$$z_n = T \int_{-1/2T}^{1/2T} Z(f)\, e^{-j2\pi nfT}\, df = T\, x(-nT)$$

$$\Rightarrow Z(f) = T + T\, e^{-j2\pi fT}$$

at $T = \frac{1}{2W}$, $X(f) = \begin{cases} \frac{1}{W} e^{-j\pi f/2W} \cos\left(\frac{\pi f}{2W}\right), & |f| < W \\ 0, & \text{other} \end{cases}$ (2m)

$$x(t) = \text{IFT}\{X(f)\} = \text{sinc}(2Wt) + \text{sinc}(2Wt - 1)$$

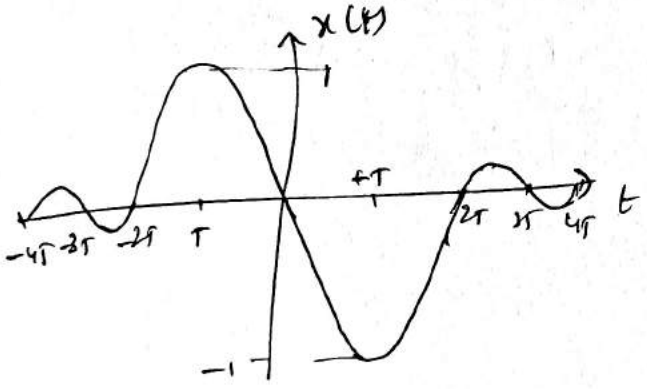




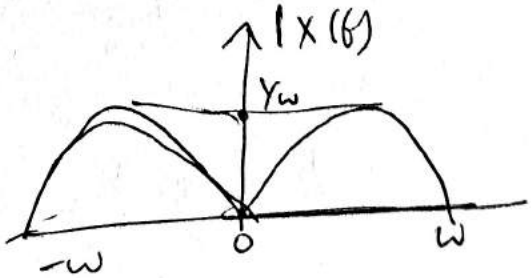
(2m)

3(b) Modified duo binary: $x(nT) = \begin{cases} 1, & n = -1 \\ -1, & n = 1 \\ 0, & \text{otherwise} \end{cases}$ (1m)

$$x(t) = \text{sinc}\left(\frac{t+T}{T}\right) - \text{sinc}\left(\frac{t-T}{T}\right)$$



$$X(f) = \begin{cases} \frac{\pi}{W} \sin\left(\frac{\pi f}{W}\right), & |f| \le W \\ 0, & |f| > W \end{cases}$$



(3m)

4a) Samples at the o/p of Rx matched filter:

$y_m = \underbrace{a_m + a_{m-1}}_{b_m \text{ Tx}^d \text{ seq ampl}} + W_m$ → seq of AWGN samples

Step 1: Precoded seq

$p_n = (d_n \ominus p_{n-1}) \bmod M$ subtn

Step 2: Tx^d seq

$a_n = 2p_n - 1$

Step 3: Rx^d seq

$b_n = a_n + a_{n-1}$

Step 4: Decoded seq

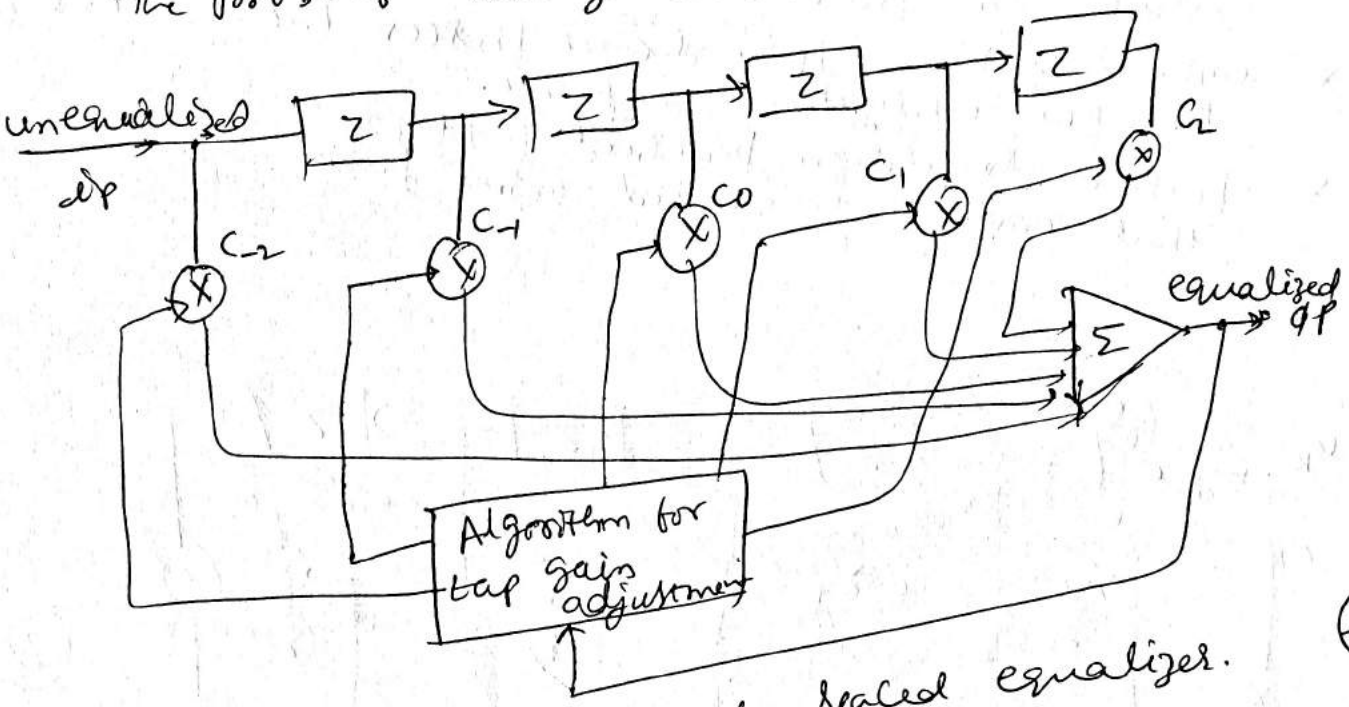
$d_n = \left[\frac{b_n}{2} \oplus (M-1)\right] \bmod M$ addn

4x1 = (4m)

4b)

$\{d_n\}$	⊘	0	0	1	3	1	2	0	3	3	2	0	1	0
														(2m)
$\{p_n\}$	0	0	0	1	2	3	3	1	2	1	1	3	2	2
														(1m)
					1	3	3	−1	1	−1	−1	3	1	1
														(1m)
$\{a_n\}$	−3	−3	−3	−1										
$2p_n - 3$					1	3	3	1	1	−1	−1	3	1	1
	−6	−6	−4	0	4	6	2	0	0	−2	2	4	2	
$\{b_n\}$														(2m)
					3	1	2	0	3	3	2	0	1	0
$\{d_n\}$	0	0	1											

5a) Equalizers are ckt to reduce ISI & to minimize the prob. of wrong decisions. (1m)



(2m)

(3m)

* FIR equalizer → Symbol spaced equalizer.
* $\frac{1}{2}$ Hz $2\omega > \frac{1}{4}$ Expl^n —

5b)

$\{d_n\}$	-		1	0	0	1	0	1	1	0	0	1	0
$\{p_n\}$	0		1	1	1	0	0	1	0	0	0	1	1
			1	1	1	-1	-1	1	-1	-1	-1	1	1
$\{a_n\}$	-1												
$\{b_n\}$		0	2	2	0	-2	0	0	-2	-2	0	2	
$\{d_n\}$		1	0	0	1	0	1	1	0	0	1	0	

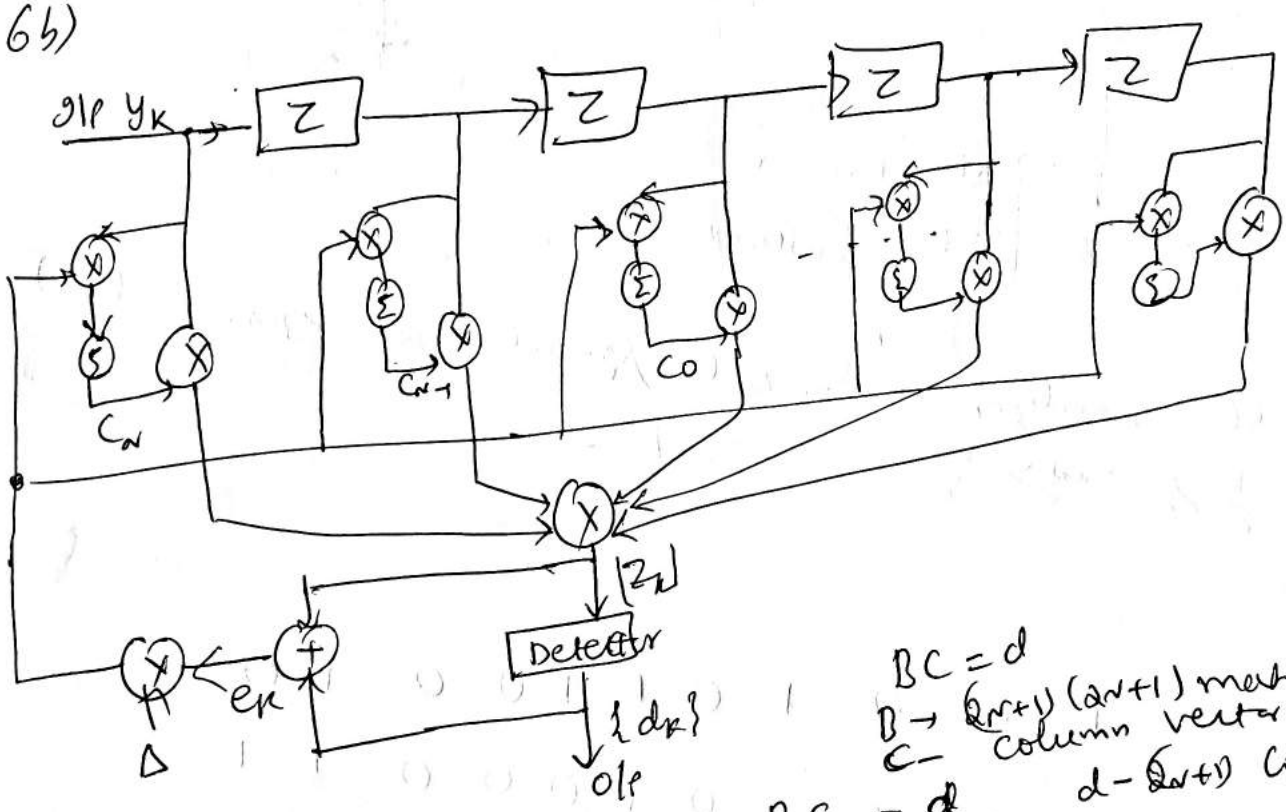
1×4 = (4M)

6a) Benefit of raised cosine spectrum:

* Decays as $1/t^3$ for $\alpha > 0$, $\Rightarrow$ Sampling offset results in finite ISI
* with larged α pulse decays faster but the BW utilization is poorer.
* Possible to design practical filters that implement raised cosine pulse

$1 \times 3 = (2m)$

6b)



(3m)

$BC = d$

B → (2N+1)(2N+1) matrix

C → column vector

d → (2N+1) Column vector

$B C_k - d$

Gradient vector $g_k =$

Coefficient C_k,

$C_{k+1} \equiv C_k - \Delta g_k$

$\hat{C}_{k+1} = \hat{C}_k - \Delta \hat{g}_k$

$\hat{g}_k$ → gradient vector

$\hat{g}_k = -e_k y_k$

$e_k = a_k - z_k$

$\hat{C}_{k+1} = \hat{C}_k + \Delta e_k y_k$

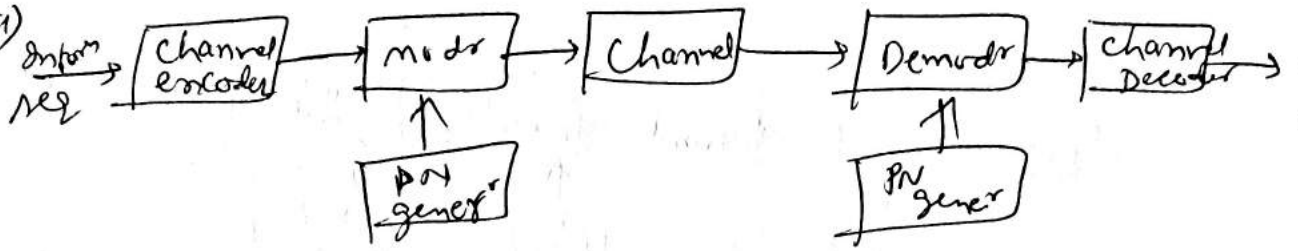
$\hat{C}$ - tap coefficient

e_k - diff b/w desired & actual

y_k - Column vector of 2N+1 signal

(4m)

7a)

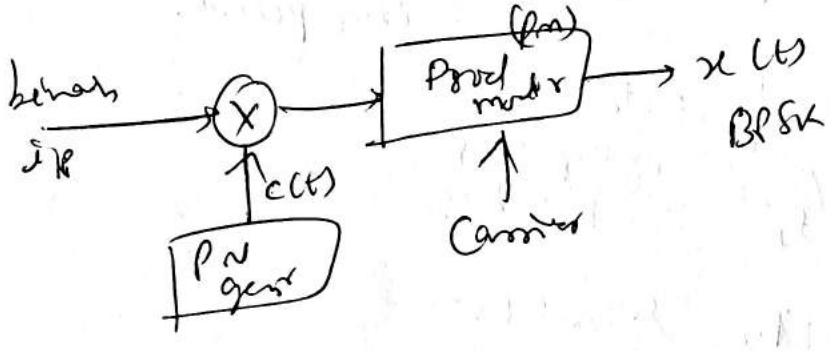


(2m)

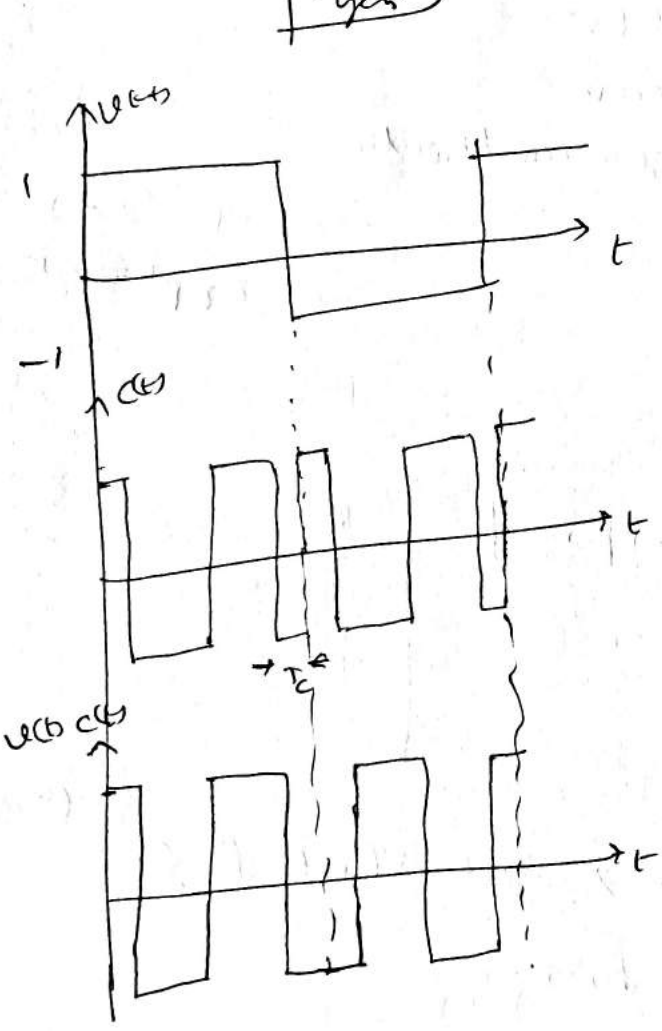
Data of interest occupies a BW in excess of minimum BW necessary to send data (3m)

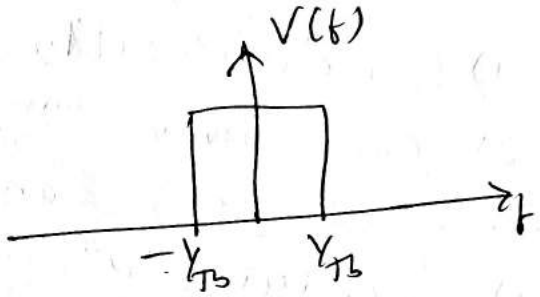
+ Expln

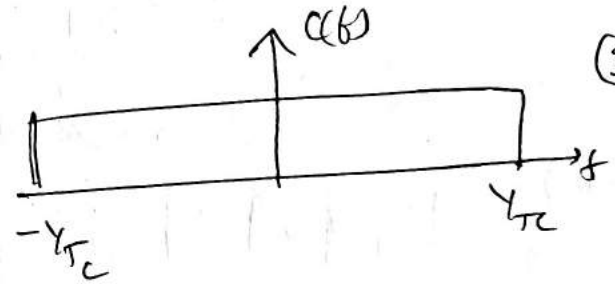
7b)



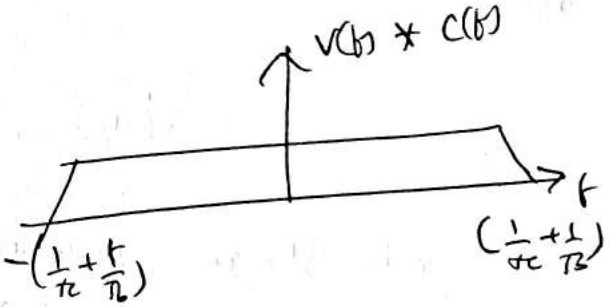
(1m)





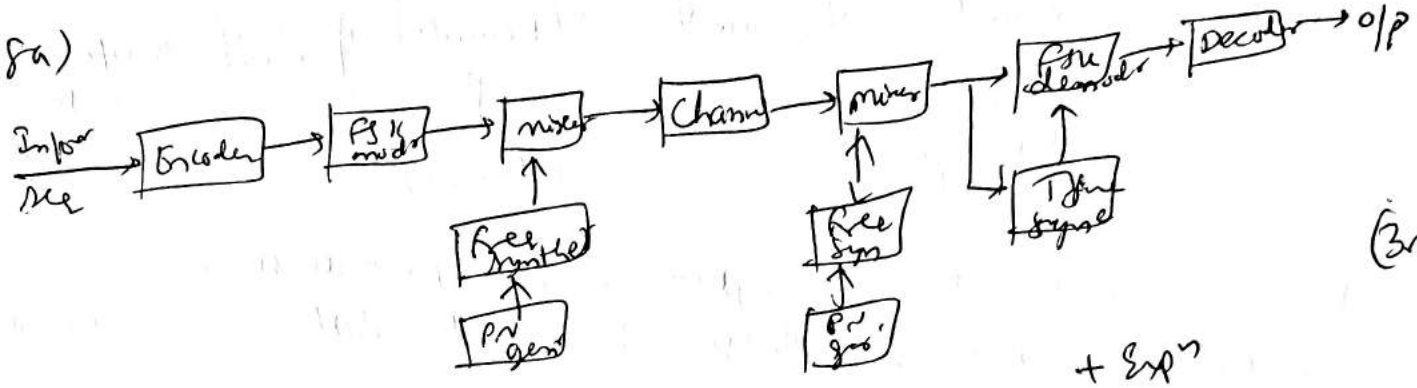


(3m)



Expln (1m)

8a)



(3m)

+ Expn

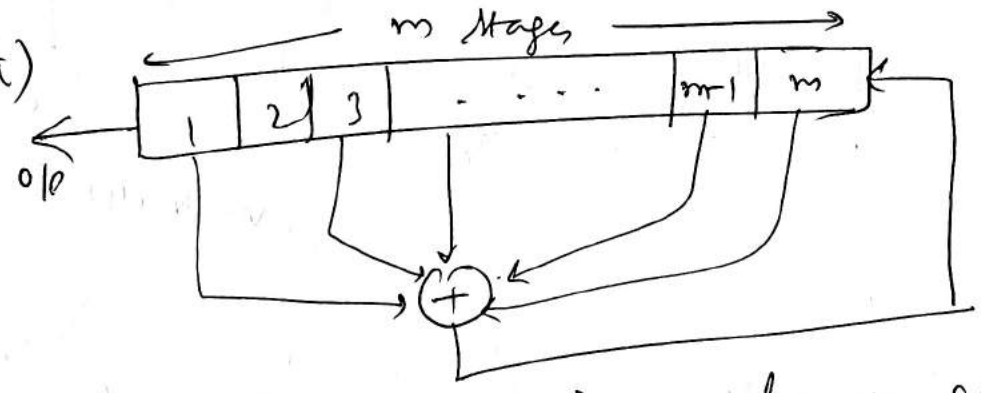
Carrier freq hops but regular interval of Tc
– chip period. (3m)

chip rate, $R_c = \frac{1}{T_c} = f_c$

$PG = L_c = f_c / f_b = \frac{\text{chip freq}}{\text{bit freq}}$

8b) 1) Low detectability signal txn
2) Code division multiple access (2m)
3) Comm over channels with multipath
4) wireless LANs + (2m)
one applnexpn

9a)



(2m)

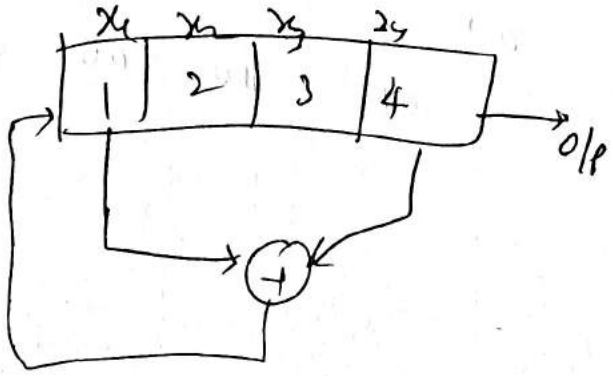
m- stage maximum-length Shift Reg

Length $L = 2^m - 1$ bits.

+ Expn

Properties: (1) Balance property
(2) Run
(3) Autocorrelation (2m)

9b)



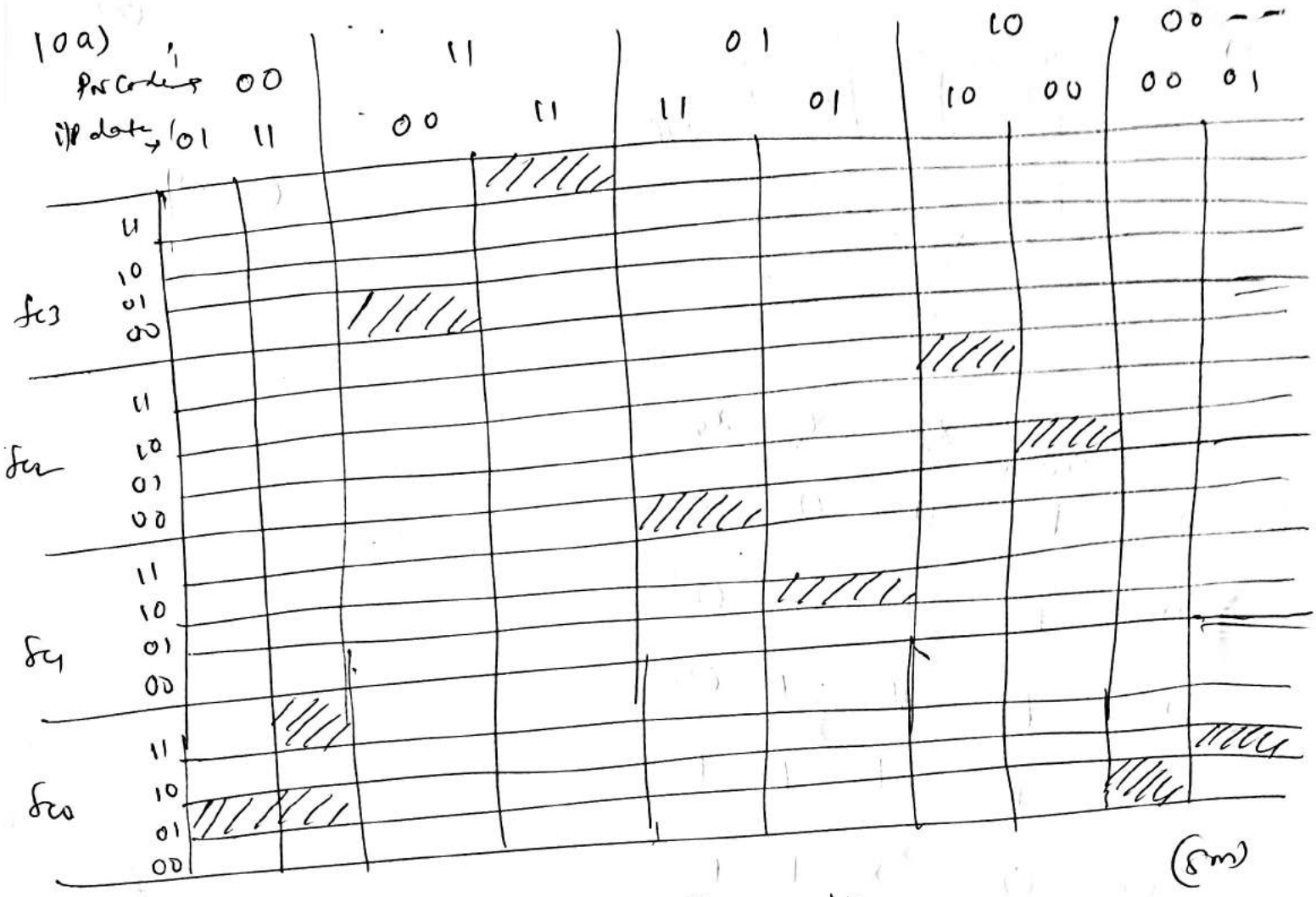
⑤

(2m)

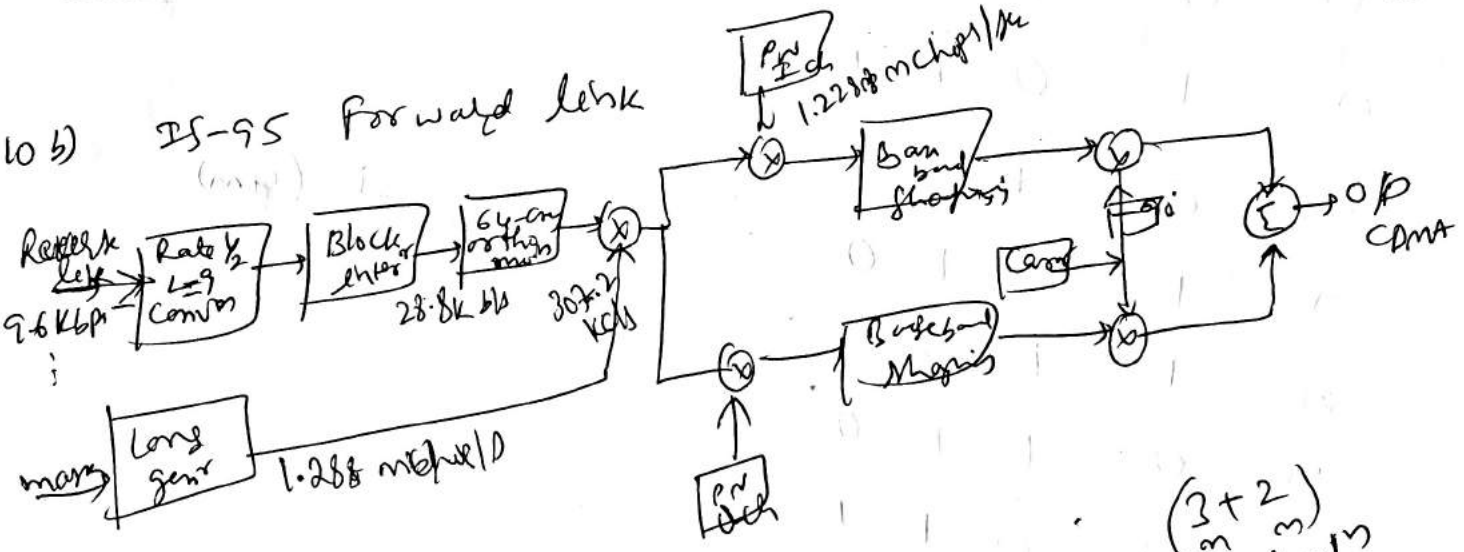
	x_1	x_2	x_3	x_4
	$= x_1 \oplus x_4$			
Initial	1	0	0	0
2)	1	1	0	0
3)	1	1	1	0
4)	1	1	1	1
5)	0	1	1	1
6)	1	0	1	1
7)	0	1	0	1
8)	1	0	1	0
9)	1	1	0	1
10)	0	1	1	0
11)	0	0	1	1
12)	1	0	0	1
13)	0	1	0	0
14)	0	0	1	0
15)	0	0	0	1
—	—	1	0	0	0

+ (4m)

10a)



10 b) IS-95 Forward link



1	R	N							

RNS INSTITUTE OF TECHNOLOGY

Department: Electrical and Electronics Engineering

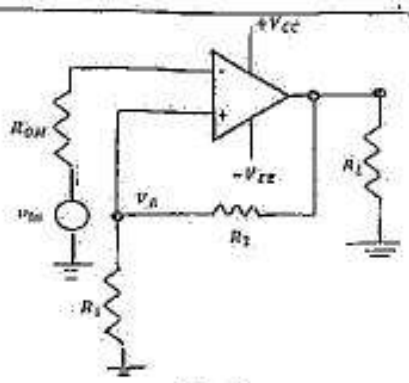
II INTERNAL TEST — **Date: 30-07-22**

SEM: IV — **Time: 9:00-10:30pm**

SUB:OP-AMPS & LINEAR IC's — **Max Marks: 50**

SUB CODE: 18EE46

Answer The Following Questions

Q No.	Question	Marks	BCL	CO
1(a)	A PLL system with a 105 kHz input has a VCO with a 100 kHz free running frequency and a 3.3 kHz/V sensitivity. The phase detector sensitivity is 0.68 V/rad and the amplifier gain is 5. Calculate (i) The loop gain (ii) Input/Output phase difference (iii) The static error voltage (iv) Control voltage (v) Tracking range	6M	L3	CO5
1(b)	Explain how 555 timer can be used as a pulse stretcher.	4M	L3	CO5
	OR			
2(a)	Draw the pin diagram of a 555 timer IC.	2M	L1	CO5
2(b)	With the help of a neat circuit diagram, explain the operation of 555 timer IC when used as a monostable mulitvibrator. Draw the relevant waveforms.	8M	L3	CO5
3(a)	Obtain an expression for loop gain of PLL	4M	L2	CO5
3(b)	With a neat circuit diagram and relevant equations explain the operation of Voltage to Current converter with grounded load.	6M	L3	CO3
	OR			
4(a)	Explain the operation of a basic comparator using a neat circuit diagram and relevant waveforms.	6M	L3	CO3
4(b)	Draw the circuit and waveforms for (i) Inverting ZCD (ii) Non-inverting ZCD	4M	L3	CO3
5(a)	Explain the operation of a square wave generator using circuit diagram and waveforms.	6M	L3 L4	CO3
5(b)	Design a square wave oscillator for frequency of oscillations $f_o = 1kHz$. Use 741 op-amp with dc supply voltages = $\pm 15V$	4M	L3	CO3
	OR			
6	Explain the operation of signal generator which provides square and triangular wave. Draw the relevant waveforms and write the relevant equations.	10M	L3 L4	CO3
7	 Fig. 7 (i)What is Schmitt Trigger? (ii) Why is Schmitt Trigger also known as a regenerative comparator? (iii) Draw the input and output voltage waveforms for the Schmitt Trigger circuit shown in fig. 7 (iv) Draw the output voltage versus input voltage plot of hysteresis voltage for the Schmitt Trigger circuit shown in fig. 7	10M	L1 L2 L3 L4	CO3

	(v) In the circuit shown below R_1=100Ω, R_2=56kΩ, v_{in}=1 V peak to peak sine wave and the op-amp is supply voltages. =±15V. Determine the threshold voltages. (vi) Modify the circuit shown in fig. 7 to make lower triggering point, LTP=0V.			
	OR			
8(a)	Explain the operation of an RC Phase shift oscillator using a neat circuit diagram and waveforms.	5M	L3	CO3
8(b)	Explain the characteristics of comparators.	5M	L1	CO3
9(a)	With the help of a block diagram and relevant waveforms, explain the operation of PLL.	8M	L2	CO5
9(b)	How can we implement phase comparator using XOR gates.	2M	L3	CO5
	OR			
10(a)	Explain tracking range of a PLL with the help of v_e/f graph. v_e – *error voltage and* f – *frequency.*	4M	L2	CO5
10(b)	With a neat block digram and waveforms, explain how PLL can be used to implement frequency synthesizer?	6M	L3	CO5

QUIZ-1

1. The term monostable means
(a) one stable state (b) one frequency (c) one time constant (d) one output

2. A PLL maintains lock by comparing
(a) The frequency of two signals (b) The phase of two signals
(c) The amplitude of two signals (d) All of these

3. Who invented the operational amplifier?
(a) Emily davenport (b) Dr. Gordan Moore
(c) Karl D Swartzel (d) James Watt

4. Which one of the following is not an input or output of the 555 timer
(a) threshold (b) trigger (c) discharge (d) clock

5. The ratio of differential gain to common-mode gain is called .....
(a) Common mode rejection (b) Differential rejection
(c) Amplitude (d) Phase

6. Negative feedback in a voltage amplifier .....
(a) Increases the input and output impedance
(b) Increases input impedance and bandwidth
(c) Decreases input impedance and bandwidth
(d) decreases output impedance and bandwidth

7. The op-amp can amplify
(a) ac signals only
(b) dc signals only
(c) both ac and dc signals
(d) Neither ac nor dc signals

8. An ideal operational amplifier has
(a) Infinite input impedance (b) Zero output impedance
(c) Infinite bandwidth (d) All of the above

9. Slew rate of an ideal operational amplifier is .....
(a) Infinity (b) Zero (c) one (d) Ten

10. The algebraic difference between the biasing currents flowing into an inverting and non-inverting terminal of an op-amp is .....
(a) Input bias current (b) Input offset current
(c) Output bias current (d) Output offset current

OP-AMP & LIC II Test

Scheme and Solution

1)a (i) $A_L = K_d K_0 A_v = 0.68 \times 3.3 \times 5 = 11.22\ KHz/rad$ — 1M

(ii) $\Delta\phi = \frac{\Delta f_0}{A_L} = \frac{10.5KHz - 100KHz}{11.22KHz/rad} = 0.45\ rad = 25.5^\circ$ — 1M

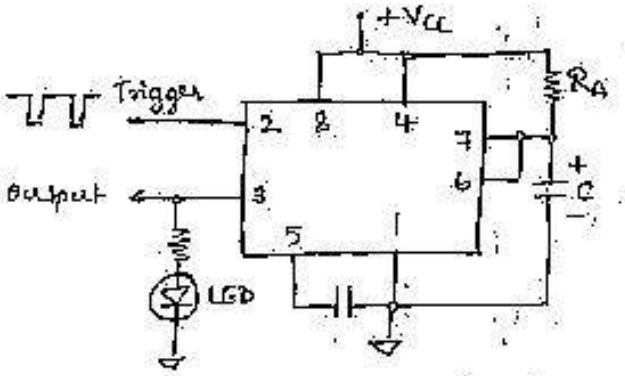
$\phi = \pi/2 + \Delta\phi = \pi/2 + 0.45 = 2.02\ rad$ — 1M

(iii) $v_e = K_d \Delta\phi = 0.68\ V/rad \times 0.43\ rad = 306\ mV$ — 1M

(iv) $v_o = A_v v_e = 5 \times 306\ mV = 1.53\ V$ — 1M

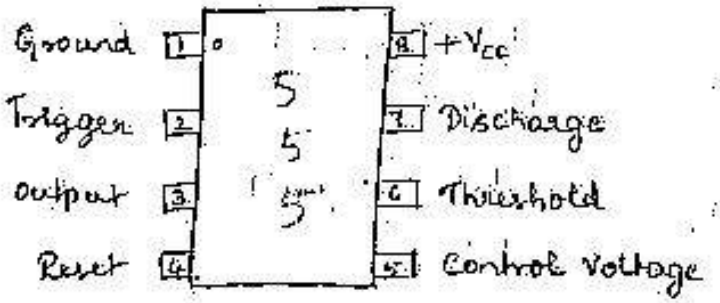
(v) $f_{re(max)} = \pm A_L \pi/2 = \pm 11.22\ KHz \times \pi/2 = \pm 17.6KHz$ — 1M

1b) 555 timer monostable circuit can be used — CKt - 2M



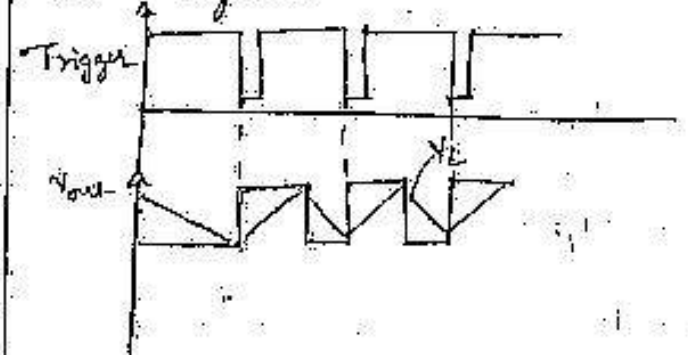
Output pulse width can be made of longer duration than negative pulse width of trigger input by using eqn $t_p = 1.1 R_A C$ — Exp - 2M

2a)



2M

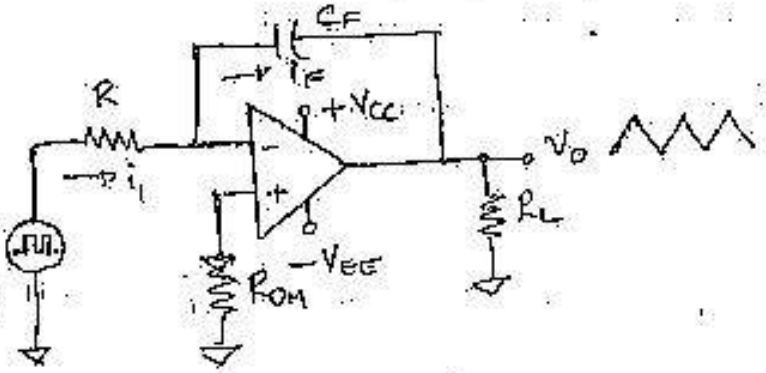
2b) CKt diagram — 2M



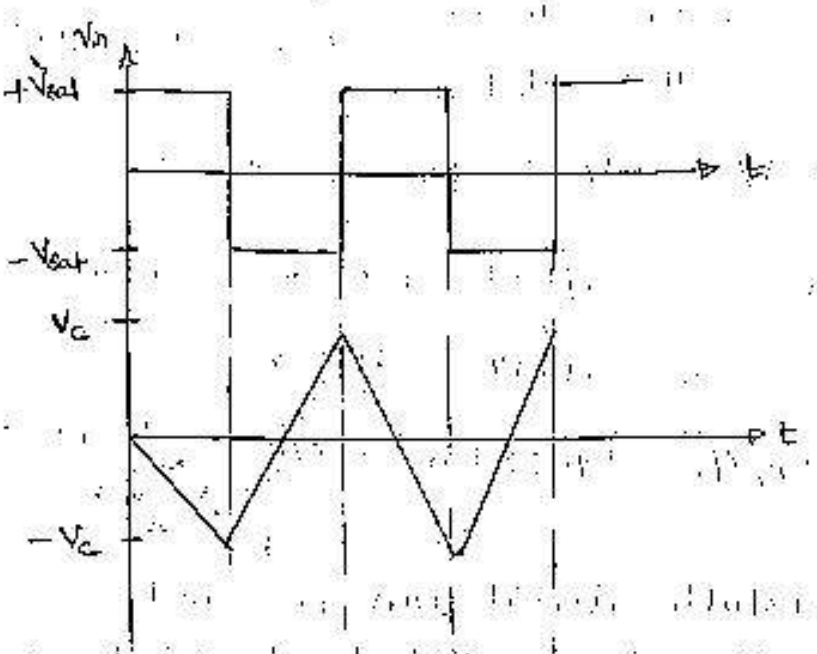
2M

Exp - 4M

3a)



2M



2M

$$i_1 = i_F \qquad i_1 = -C_F \frac{dv_c}{dt}$$

$$\frac{v_{in}}{R} = -C_F \frac{dv_c}{dt}$$

2M

$$\frac{dv_o}{dt} = -\frac{1}{RC_F} \times v_{in}$$

$$v_c = -\frac{1}{RC_F} \int v_{in}\, dt$$

$$v_c = v_o = \frac{1}{RC_F} \int v_{in}\, dt$$

3b)

$$I_1 + I_2 = I_L$$

$$\frac{v_{in} - V_1}{R_L} + \frac{V_o - V_1}{R} = I_L$$

$$V_{in} + V_o - 2V_1 = I_L R$$

$$V_1 = \frac{V_{in} + V_o - I_L R}{2}$$

$$V_0 = 2V_1$$

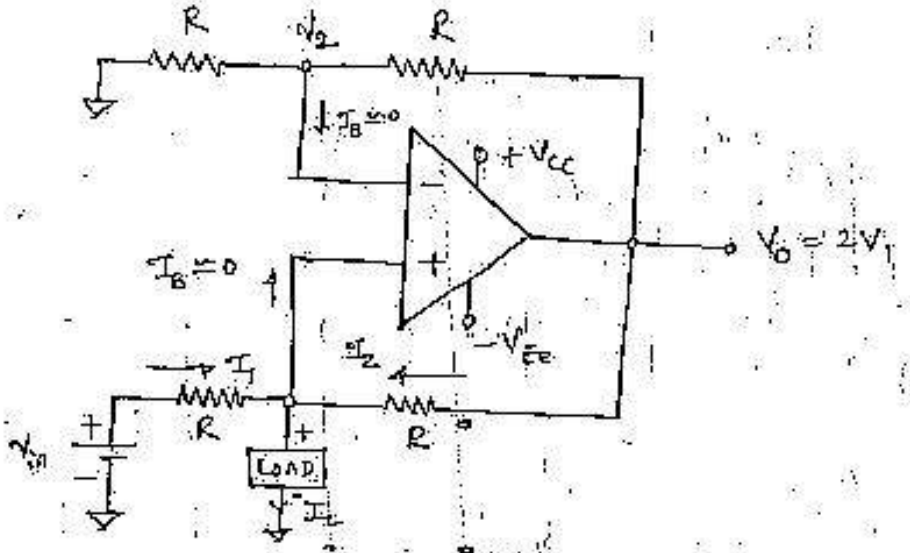
$$V_0 = 2 \times \frac{V_{in} + V_0 - I_L R}{2}$$

$$V_0 = V_{in} + V_0 - I_L R$$

i.e., $V_{in} = I_L R$

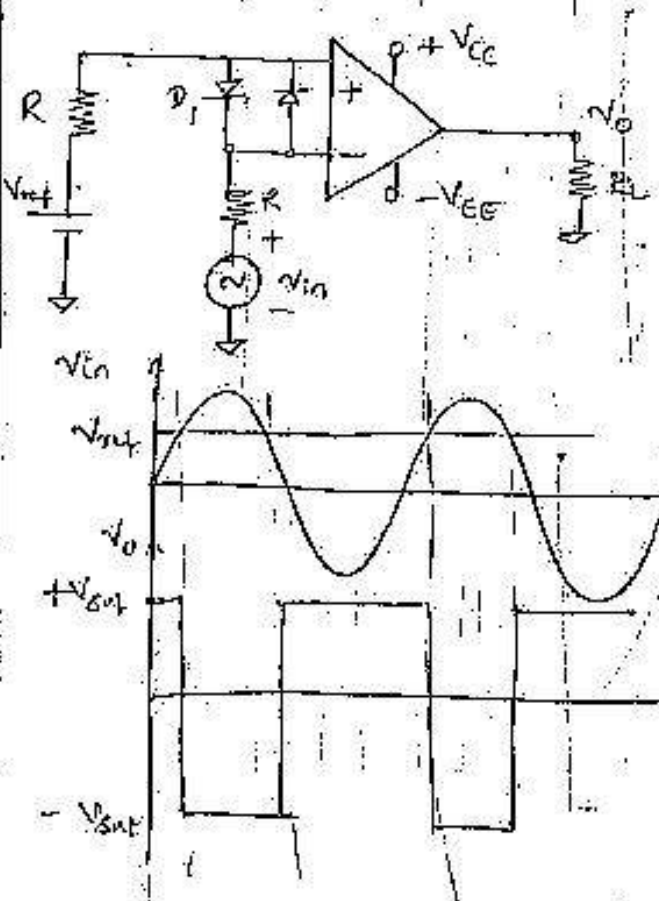
$$I_L = \frac{V_{in}}{R}$$

2M



2M

4.a)



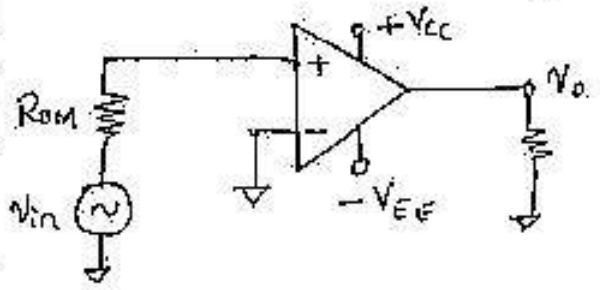
2M

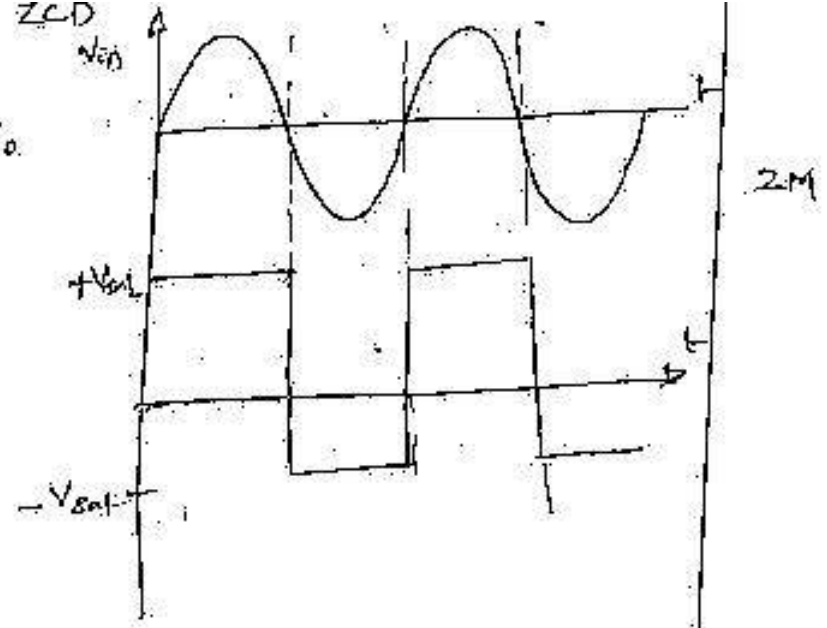
Exp - 2M

2M

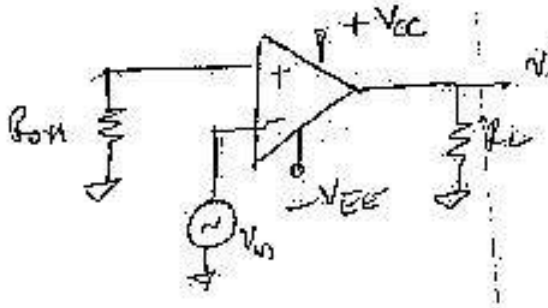
4b)

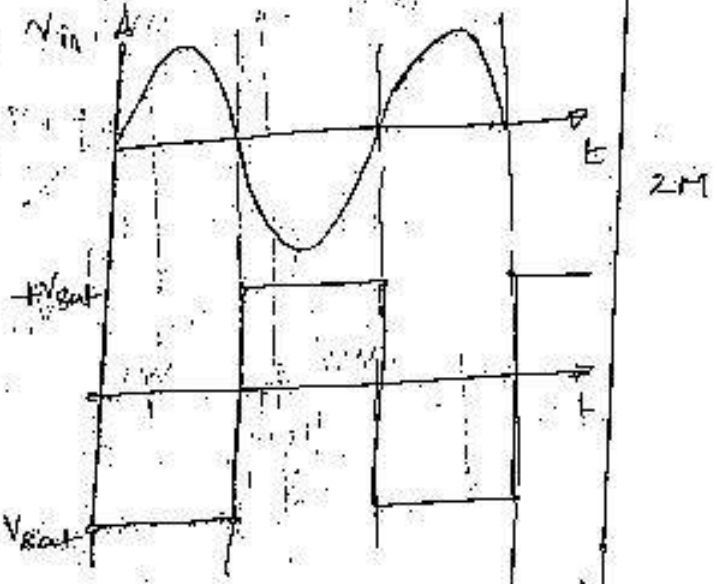
Non Inverting ZCD



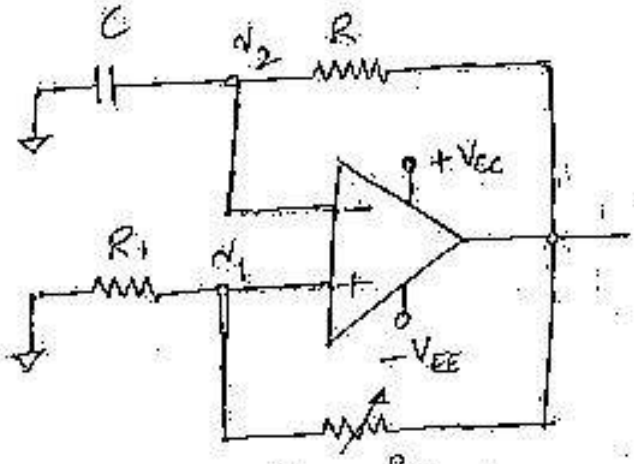


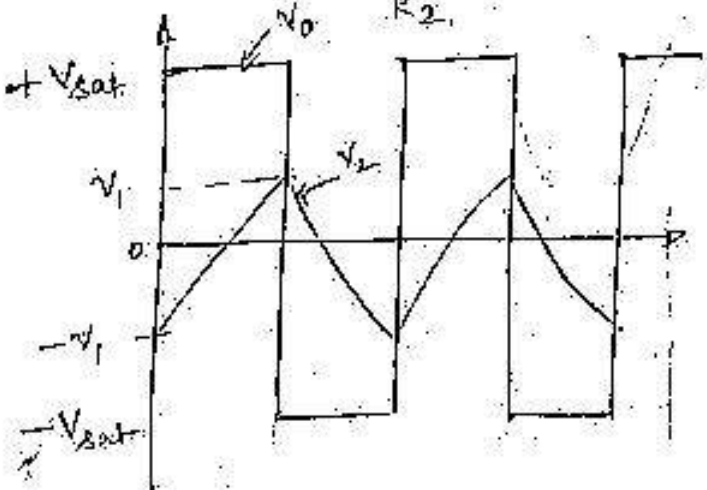
Inverting ZCD





5a)





2M

2M

2M

Exp - 2M

5) Use $R_2 = 1.16 R_1$ — 1M

Let $R_1 = 10\,K\Omega$ — 1M

$\therefore R_2 = 11.6\,K\Omega$

[Use $20K\Omega$ pot].

1M

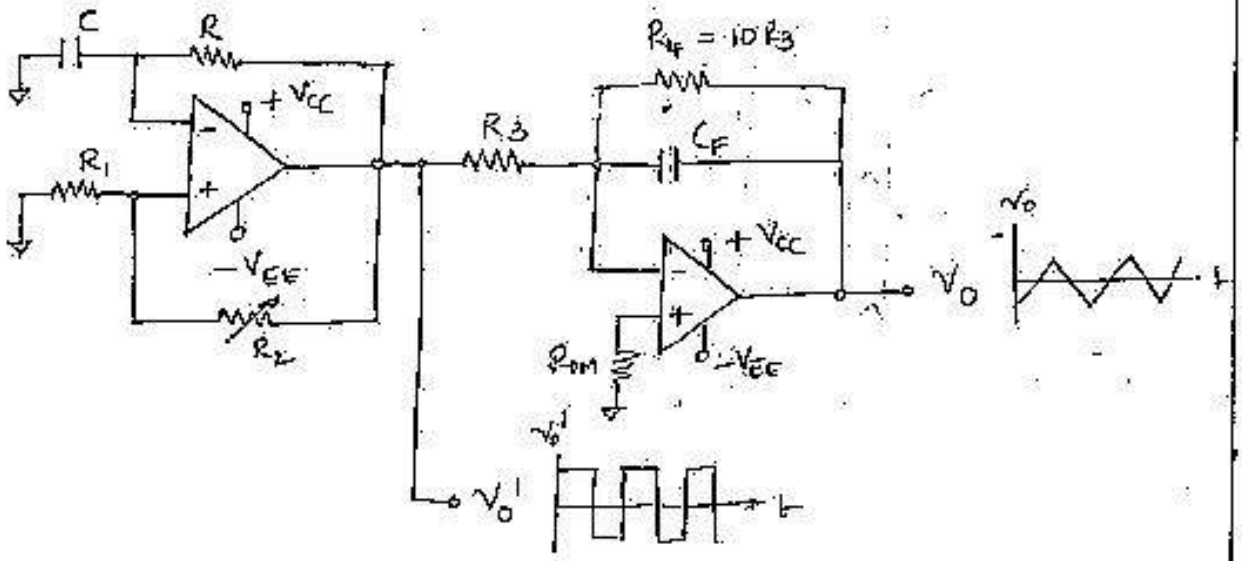
Let $C = 0.05\,\mu F$

$$R = \frac{1}{2f_0 C} = \frac{1}{2 \times 1 \times 10^3 \times 0.05 \times 10^{-6}}$$

1M

$$R = 10\,K\Omega$$

6)



4M

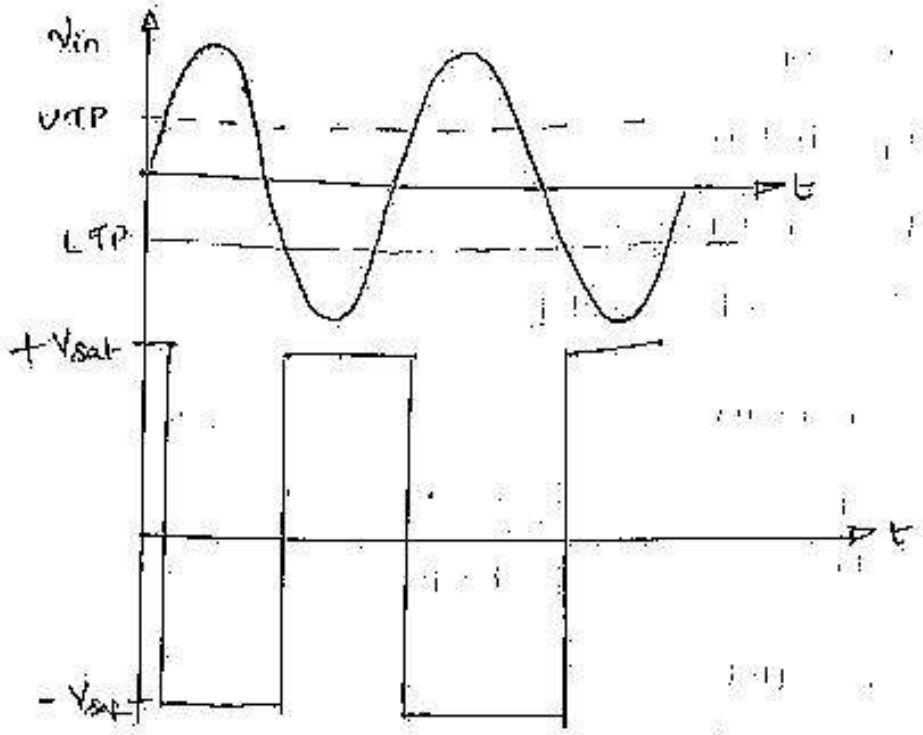
Waveforms — 2M

Explanation — 4M

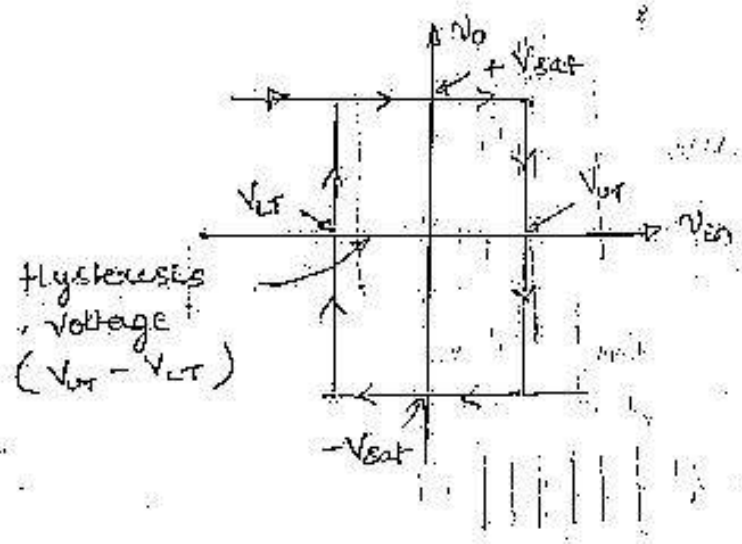
7) (i) Schmitt Trigger also known as squaring circuit in which input voltage triggers the output everytime it exceeds a certain voltage levels called UTP and LTP — 1M

(ii) Due to positive feedback — 1M

(iii)



2M



2M

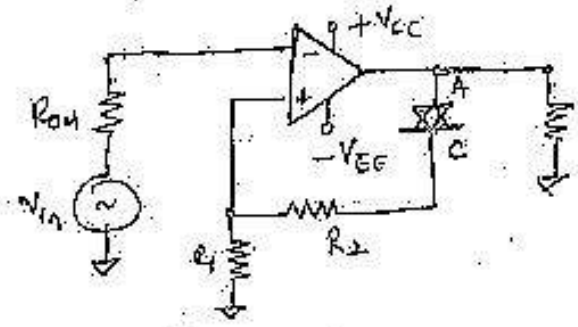
v) $V_{UT} = \dfrac{+V_{sat}(R_1)}{R_1 + R_2} = +14V \times \dfrac{100}{100 + (56 \times 10^3)}$ 1M

$= 25mV$

$V_{LT} = \dfrac{-V_{sat}(R_1)}{R_1 + R_2} = -14V \times \dfrac{100}{100 + (56 \times 10^3)}$ 1M

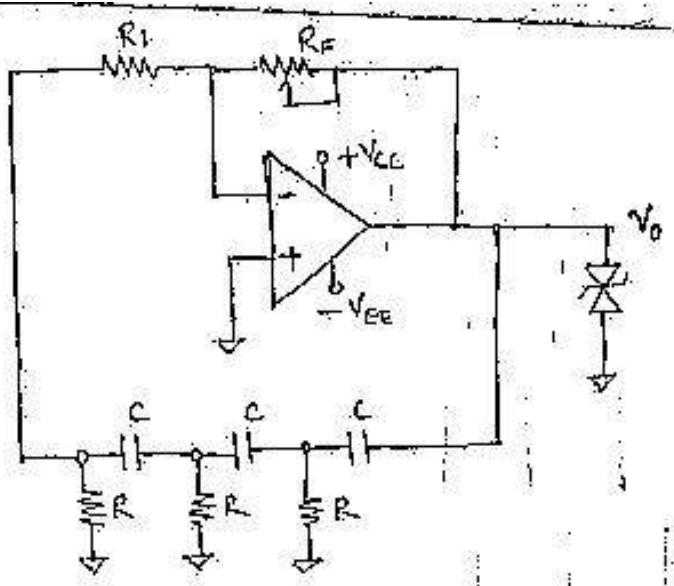
$= -25mV$

(vi)

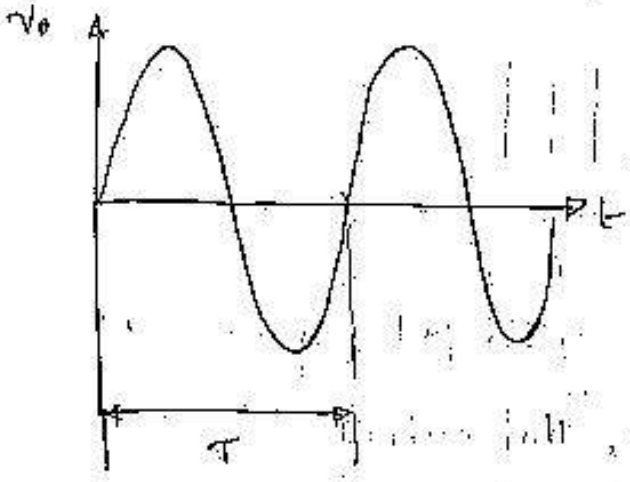


2M

8a)



2M



2M

$f_0 = \frac{1}{2\pi\sqrt{6}RC}$ ... $A_V \simeq 29$ i.e $\left|\frac{R_F}{R_1}\right| = 29$ 1M

$R_F = 29 R_1$

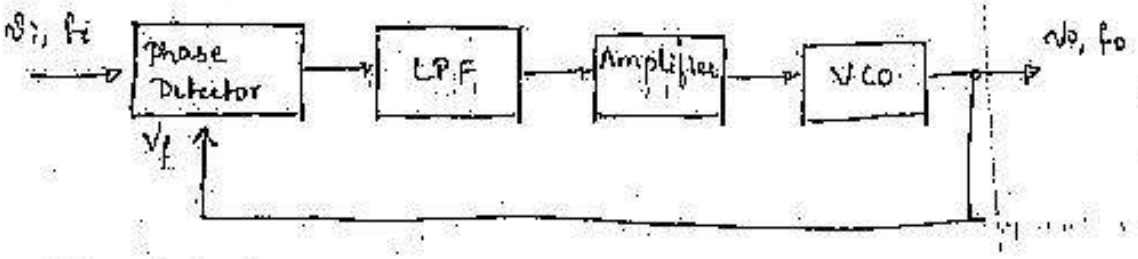
Explanation 1M

8b) Speed of operation 2M

Accuracy 2M

Compatibility 1M

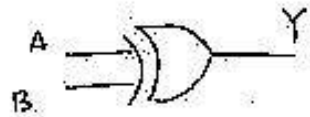
9a)



1M

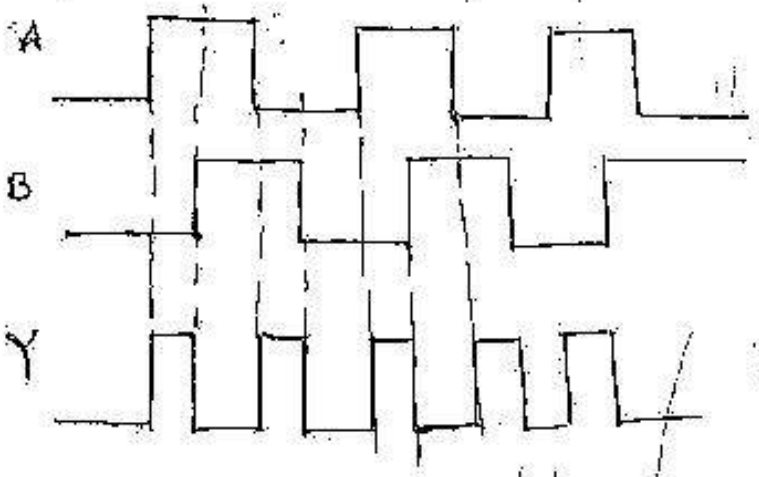
Waveforms: 3M

explanation 4M

9b) 

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

1M

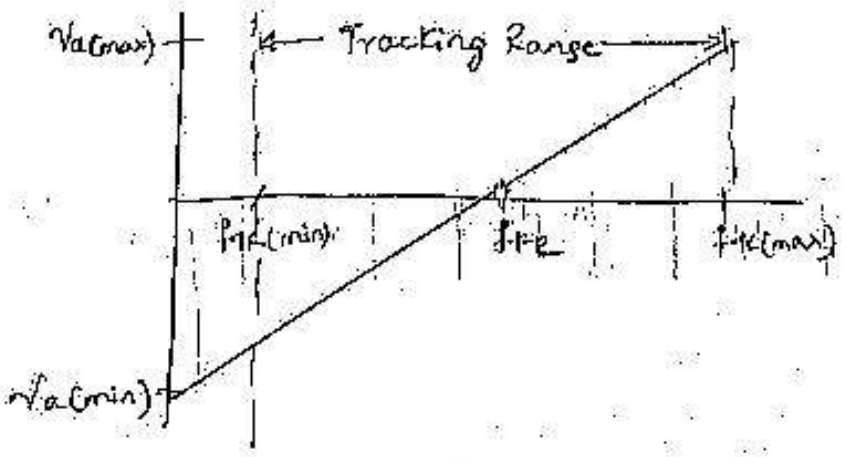


1M

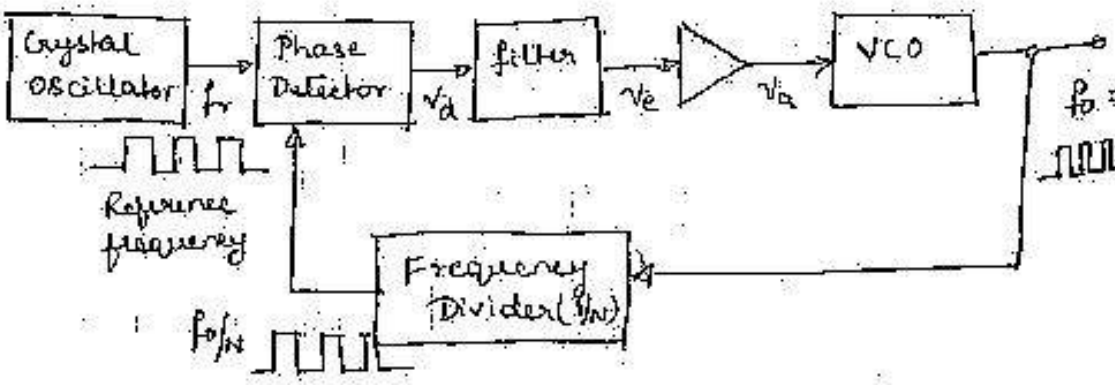
10a) When the frequency of input signal to a PLL system is changed, the output frequency changes to follow the input frequency. However for each PLL there is an upper and lower frequency limit beyond which f_o will not track f_i. The range of frequencies between these limits is known as tracking range f_{TR}.

2M

$$f_{TR} = \pm A_L \Delta\phi$$



2M

10.) 

2M

Explanation

4M

RNS INSTITUTE OF TECHNOLOGY | USN:

DEPARTMENT OF EIE

(**AICTE** Approved, **VTU** Affiliated and **NAAC 'A'** Accredited)

(**UG programs** – CSE, ECE, ISE, EIE and EEE have been **Accredited** by **NBA** for the *Academic Years 2018-19, 2019-20,2020-21, 2021-22,2022-25*)

Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098

II Internals

Sem: IV
Subject: Process Instrumentation
Subject Code: 18EI45

Date: 29.07.2021
Time: 90Min
Max. Marks: 50

Instruction: Answer any 5 full questions, selecting at least ONE question from each part.

Q.NO		Question	Marks	BCL*	CO
1	a	Define the following terms 1)absolute viscosity 2) Apparent viscosity 3) Consistency 4) Kinematic Viscosity	4	L2	CO4
	b	Highlight the importance points for selecting a viscometer and discuss its applications.	6	L1	
		OR			
2	a	Explain the construction and working of Capillary tube viscometer used in laboratory.	5	L1	CO4
	b	With necessary equations explain the working principle of Saybolt viscometer.	5	L2	
3	a	With a neat sketch explain measurement of viscosity using falling steel ball method	5	L1	CO4
	b	Discuss the behavior of Newtonian and non- Newtonian fluids with a neat characteristic curve.	5	L2	
		OR			
4	a	With a neat sketch discuss the operation of Cone and Plate type rotational Viscometer.	5	L2	CO4
	b	Explain the construction and working of Capillary tube extrusion viscometer used in laboratory.	5	L1	
5	a	With a neat schematic explain the operation of differential pressure continuous capillary Industrial viscometer.	10	L1	CO4
		OR			
6	a	With a neat sketch describe the working principle of single float and two float viscometers.	10	L1	CO4
7	a	Discuss the construction and working of Vibrating reed viscometer with a neat sketch.	6	L1	CO4
	b	Define turbidity. With a neat sketch discuss the working operation of transmission type turbidity meter.	4	L2	
		OR			
8	a	With a neat sketch describe the working principle of Dry and wet bulb psychrometers.	5	L2	CO5
	b	Discuss how Humidity is measured using Hair hygrometers with a neat schematic.	5	L1	
9	a	Discuss the working Principle of capacitance Hygrometer for the measurement of Humidity, with a neat sketch.	6	L2	CO5
	b	Define the following terms i)Relative Humidity ii) saturation pressure iii) Specific Humidity iv) Hygrometer	4	L1	
		OR			
10	a	Define Dew point.	2	L1	CO5
	b	Describe how dew point temperature can be determined using surface conductivity method with a neat sketch?	8	L2	

* Blooms Cognitive Level: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-

Course Outcomes:

CO4: Recognize the appropriate transducers/sensors based on the needs of the viscosity and Turbi measurement.

CO5: Use the suitable sensors for the measurement of Humidity and Moisture.

Paper setter (S J Savita)	Paper reviewer (G N Srikanth)	HOD (Dr. Andhe Pallavi)
Sj Savity	G.N. Srikanth	28/11/22

MAPPING OF SYLLABUS CONTENTS TO QUESTIONS

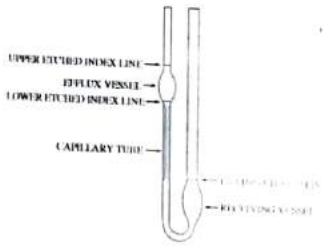
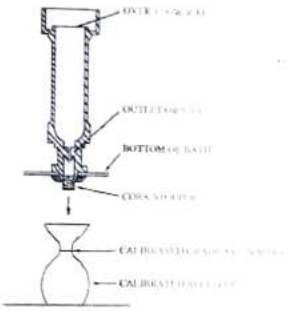
Module 4	1a	Viscosity Measurement: Definition and units
	1b	selection of viscometer
	2a	Laboratory Viscometers – Capillary
	2b	Saybolt viscometer
	3a	falling steel ball method
	3b	Newtonian and non- Newtonian fluids
	4a	Cone and Plate type rotational Viscometer.
	4b	Capillary tube extrusion viscometer
	5	differential pressure continuous capillary Industrial viscometer.
	6	single float and two float viscometers
	7a	Vibrating reed viscometer
	7b	Turbidity: Definition, transmission type turbidity meter
Module 5	8a.	Dry and wet bulb psychrometers.
	8b	Hair hygrometers
	9a	capacitance Hygrometer
	9b	Humidity Measurement: Definition and terminologies
	10a	Dew point
	10b	dew-point hygrometers

Module 4

Viscosity Measurement: Definition and units, selection of viscometer, viscometer applications. Laboratory Viscometers – Capillary, capillary extrusion, Efflux cup (Saybolt viscometer), Falling ball, Rotational viscometer, Cone & plate viscometer. Industrial Viscometers - differential pressure continuous capillary viscometer, single and two float viscometer, cone and plate plastometer, vibrating reed viscometer. Turbidity: Definition, transmission type turbidity meter, light scattering turbidity meter.

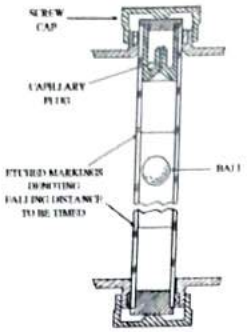
Module 5

Humidity Measurement: Definition and terminologies, dry and wet bulb psychrometers (Sling psychrometer), hair hygrometers, thin film capacitance humidity sensor, dew-point hygrometers,

Q.NO		SCHEME & SOLUTION
1	a	Define the following terms 1)absolute viscosity 2) Apparent viscosity 3) Consistency 4) Kinematic Viscosity **Absolute (dynamic) viscosity** (μ): Constant of proportionality between applied stress and resulting shear velocity (Newton's hypothesis). **Apparent viscosity:** Viscosity of non-Newtonian fluid under given conditions. Same as consistency. **Consistency:** Resistance of a substance to deformation. It is the viscosity for a Newtonian fluid and apparent viscosity for a non-Newtonian fluid. **Kinematic viscosity** (υ): Dynamic viscosity/density = $\upsilon = \mu/\rho$.
	b	Highlight the importance points for selecting a viscometer and discuss its applications. 1. The instrument used is for laboratory use or for continuous measurement in the plant for control. 2. Type of materials in contact with the viscometer. 3. The relationship between viscosity and operating temperature. 4. Testing environment —does the viscometer need to be explosion proof? 5. The viscosity ranges to be measured. 6. Accuracy, sensitivity, and repeatability (for continuous process viscometer) required. 7. Special features are needed. 8. The viscometer response time requirement. 9. Flow conditions—laminar or turbulent
2	a	Explain the construction and working of Capillary tube viscometer used in laboratory.  The fluid is then permitted to flow down through the capillary by releasing the suction. The stopwatch is started when the fluid surface passes the upper etched index line. The watch is stopped when the surface passes the lower etched index line of the efflux vessel. This efflux time (t) is multiplied by the viscometer calibration constant to obtain the kinematic viscosity of the sample fluid.
	b	With necessary equations explain the working principle of Saybolt viscometer.  It measures time required for 60cc of sample fluid to flow out through orifice having dimension of 0.176cm dia and 1.255cm in length. SUS (t) can be converted to kinematic viscosity by the following equations.

When t<100s, v=0.226t-195/t Centistokes
When t>100s, v=0.220t-135/t Centistokes
Viscosity should be conducted in room free from drafts and rapid changes in temperature to [illegible] accuracy.

3 a With a neat sketch explain measurement of viscosity using falling steel ball method

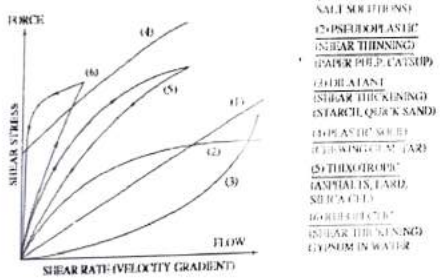


The absolute viscosity of the fluid can be found by multiplying that time interval by a factor that reflects the effects of temperature, specific gravity of the fluid, and the characteristics of the ball used in accordance with the following formula:

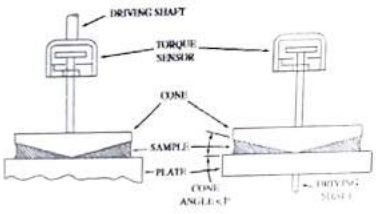
$\mu = t \times (\rho SB - \rho SF) \times B$

Where μ= absolute viscosity, centipoise
t= time interval of the falling ball, sec
ρSB= Specific gravity of the ball
ρSF=specific gravity of the fluid at the measuring temperature
B= ball constant

b Discuss the behavior of Newtonian and non- Newtonian fluids with a neat characteristic curve.



4 a With a neat sketch discuss the operation of Cone and Plate type rotational Viscometer.

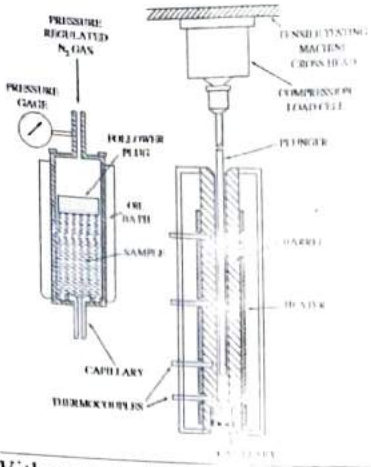


The flat plate is rotated while the conical disc is held by a torsion measuring head; in others, the conical disc is rotated through a dynamometer while the bottom flat plate is stationary.

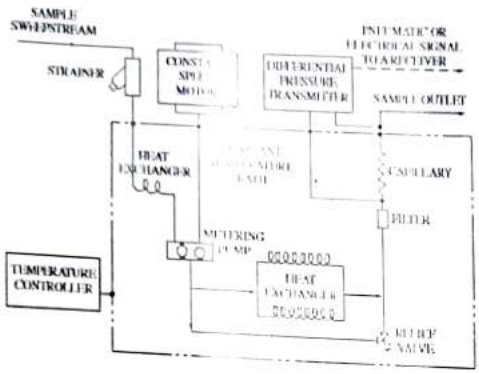
Torsion bar movement can be measured by a differential-transformer type of displacement transducer.

The viscous traction on the cone is measured by an electromechanical torque dynamometer (combination of torque spring and potentiometer).

b Explain the construction and working of Capillary tube extrusion viscometer used in laboratory.



5 With a neat schematic explain the operation of differential pressure continuous capillary Industrial viscometer.

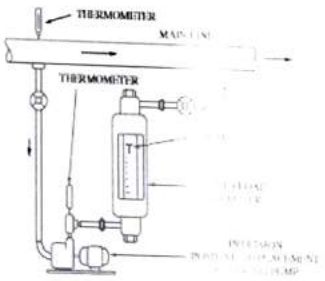


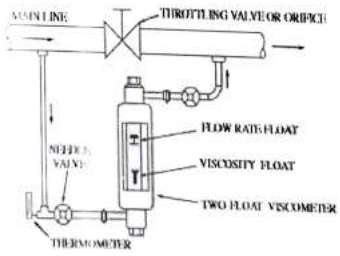
In operation, an external strainer is provided to remove any solids from the sample before it enters the viscometer. A constant sample flow rate is maintained by a precision metering pump, which is driven by a synchronous motor.

Two heat exchangers, before and after the metering pump, are used to keep the sample fluid in thermal equilibrium with the thermostatic bath.

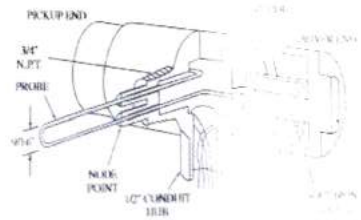
The pressure drop across the capillary is measured with a differential pressure transducer, which is connected to the inlet and outlet sides of the capillary.

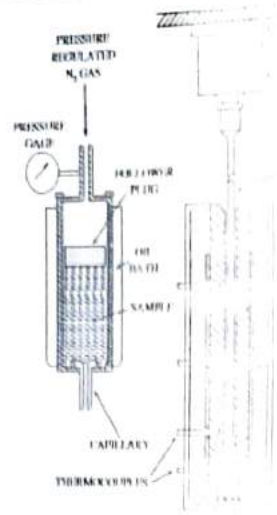
6 a With a neat sketch discuss single float and two float viscometers.



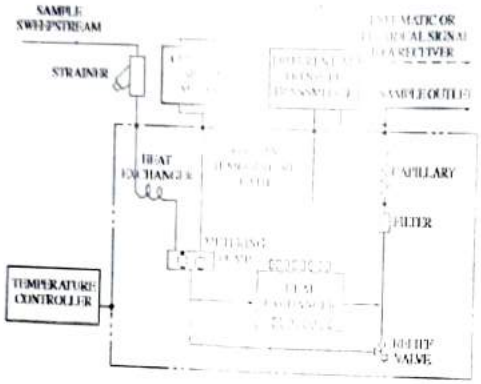


7 a Discuss the operation of Vibrating reed viscometer with a neat sketch.





5 With a neat schematic explain the operation of differential pressure continuous capillary Industrial viscometer.

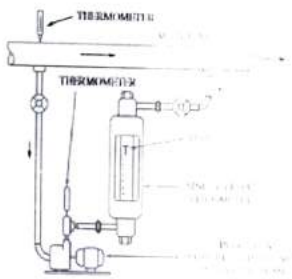


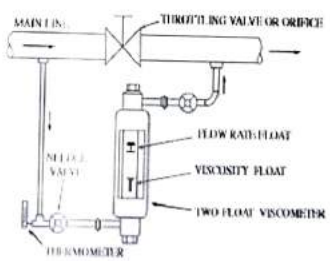
In operation, an external strainer is provided to remove any solids from the sample before it enters the viscometer. A constant sample flow rate is maintained by a precision metering pump, which is driven by a synchronous motor.

Two heat exchangers, before and after the metering pump, are used to keep the sample fluid in thermal equilibrium with the thermostatic bath.

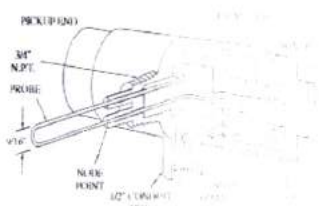
The pressure drop across the capillary is measured with a differential pressure transducer, which is connected to the inlet and outlet sides of the capillary.

6 a With a neat sketch discuss single float and two float viscometers.



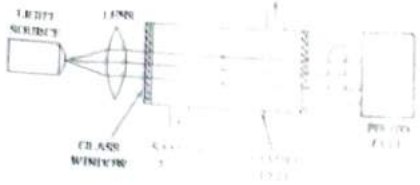


7 a Discuss the operation of Vibrating reed viscometer with a neat sketch.



Define turbidity. With a neat sketch discuss the working operation of transmission type turbidity meter.

Turbidity meters (similarly to the nephelometers) measure the cloudiness of a fluid by detecting the intensity of transmitted or reflected light.



In the forward-scattering or transmission-type turbidity sensor design the light source is on one side of the process sample, and the detector is on the other. Therefore, total attenuation is detected.

When this attenuation is the result of absorption by color, **the unit is called a colorimeter**.

When the attenuation is caused by light being scattered by solid particles, the unit is **called a turbidity meter**.

8 a With a neat sketch explain the construction and working principle of Dry and wet bulb psychrometers.

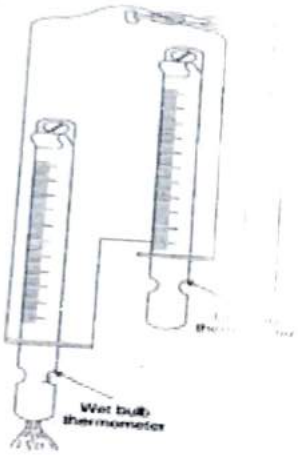


Fig. 7.38 Sling psyc

The dry-bulb thermometer is just an ordinary thermometer in terms of installation and use, and is so designated to differentiate it from its companion, which is kept wet in some manner (wrapped with a wick soaked in water).

The wet bulb is always supplied with an adequate amount of water, it is impossible to know whether the reading of the wet bulb thermometer represents the maximum depression (and the minimum temperature) that could occur for the particular conditions.

It is also necessary that the air surrounding the wet bulb is changed it a rate such that the air near the bulb will not become saturated with water vapour.

b Discuss how Humidity is measured using Hair hygrometers with a neat schematic.

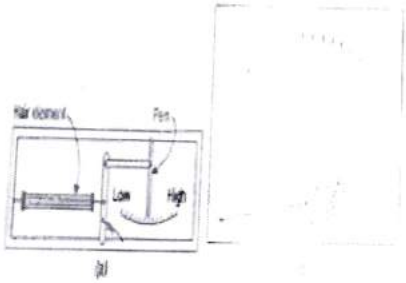
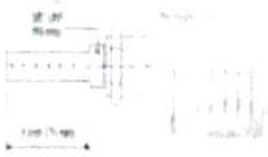


Fig. 7.44 Contraction and expansion of the hair ele positions the pointer. By suitable calibration

		The expansion and [illegible] fiber either natural or man-made, creates a change in length which is reflected [illegible]
9	a	Discuss the working [illegible] capacitance Hygrometer for the measurement of Humidity, with a neat sketch.  When exposed to [illegible] vapour penetrate through the gold layer into the aluminium oxide dielectric and are absorbed [illegible] The amount of water absorbed determines the capacitance registered by the [illegible]
	b	Define the following i)Relative Humidity The ratio of the amount of water vapour present in air gas to the amount of water vapour in a saturated mixture [illegible] temperature and pressure. ii) saturation pressure: the pressure of a fluid when condensation (or vapourisation) takes place at a given temperature (at this temperature is the saturation temperature). iii) Specific Humidity: the ratio of the mass of water vapour to the mass of dry gas in a given volume. iv) Hygrometer :An apparatus that measures humidity.
10	a	Define Dew point. Saturation temperature of a gas-water vapour mixture. It is the temperature at which the water vapour in the air [illegible] into tiny droplets of water. At this temperature, the air is holding all of the water vapour that it is possible for it to hold.
	b	Describe how dew point temperature can be determined using surface conductivity method with a neat sketch  The measuring element consists of a highly polished inert surface inlaid with an intermeshed gold grid and a thermocouple imbedded in the surface. □ A fixed potential is maintained across the gold grids, and the current flow is compared to the reference current [illegible] dew point. □ This signal is amplified and used to modulate a cooler so that the surface is maintained at the dew-point of the sample. □ The cooler is [illegible] crystal that pumps heat away from the sensor when electric power is supplied to it. □ From the thermocouple imbedded in the surface, the output is normally presented as dew-point temperature; however, [illegible] in terms of relative or specific humidity is also possible. Fig shows a sensing surface and housing of the surface conductivity type dew-point detector

USN: | 1 | R | N | | | | | | | |

R.N.S. INSTITUTE OF TECHNOLOGY
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Semester: VII A & B — I Internal Test

Sub Name: Cryptography — Max. Marks:50

Duration: 100 Minutes — Sub Code: 18CS744

Date: 24/11/2021

NOTE: Answer *FIVE* full questions.
Don't write anything on question paper other than USN.

Qn. No.		Questions	Marks	BCL	CO
1	a)	Differentiate between Stream Cipher and Block Cipher.	4	L1	CO1
	b)	User A and B exchange the key using Diffie-Hellman algorithm. Assume α=5 q=11 X_A=2 X_B=3. Find the value of Y_A, Y_B and K.	6	L2	CO3
		OR			
2	a)	List out the principles of Public Key cryptography systems.	4	L1	CO3
	b)	Perform encryption and decryption using RSA algorithm for P=3, q=11, e=7 and M=31.	6	L2	CO3
3	a)	Explain with a neat diagram Fiestel Cipher Structure.	4	L2	CO2
	b)	Using Caesar Cipher Technique, Encrypt and decrypt the following message "Meet me after the class".	6	L3	CO3
		OR			
4	a)	Define Cryptanalysis and write in detail about Brute-Force Attacks.	4	L1	CO1
	b)	Using the PlayFair techniques Encrypt the message "BALLOON" taking the key as "MONARCHY".	6	L2	CO1
5	a)	With neat diagram explain the general depiction of DES algorithm.	4	L1	CO2
	b)	Consider a Diffie Hellman scheme with a common prime q=11 and a primitive root α =2. • Show that 2 is a primitive root of 11. • If user A has public key Y_A=9, what is A's private Key? • If user B has public key Y_B=3, what is the secret Key K shared with A?	6	L3	CO3
		OR			
6	a)	Differentiate between Conventional Encryption and Public Key Cryptosystem.	4	L1	CO3
	b)	Discuss the operation, diffusion and confusion with respect to P-box and S-box.	6	L1	CO2
7	a)	With a neat diagram explain Public Key Cryptosystem.	4	L1	CO3
	b)	Using Elgamal Cryptosystem, perform encryption and decryption for the values q=19, α=10, X_A=5, k=6.	6	L3	CO3
		OR			
8	a)	Explain Diffie Hellman key exchange algorithm.	4	L2	CO3
	b)	Illustrate, the following using hill cipher technique where the block size=2 and key is 3 7 15 12	6	L3	CO3

		a) What is the cipher text corresponding to the plaintext (V W)? b) What is the plaintext corresponding to the cipher text (T Q)?			
9	a)	Explain Man-in-the-middle attack with an example.	5	L2	CO3
	b)	Encrypt the following message using the key = "DECEPTIVE" using Vigenere. Message= " we are discovered save yourself".		L3	CO1
		OR			
10	a)	Explain Elgamal Cryptosystem process.	5	L2	CO3
	b)	Discuss the security issues of RSA algorithm.	5	L2	CO3

Q.No.	Questions
1	Which of the following properties are the characteristic properties of a block cipher technique which differs from stream cipher? a)Avalanche effect b)Completeness c)Both a. and b. d)None of the above
2	Which of the following is not a type of symmetric-key cryptography technique? a)Caesar cipher b)Data Encryption Standard (DES) c)Diffie Hellman cipher d)Playfair cipher
3	Which of the following options correctly defines the Brute force attack? a. Brutally forcing the user to share the useful information like pins and passwords. b. Trying every possible key to decrypt the message. c. One entity pretends to be some other entity d. The message or information is modified before sending it to the receiver.
4	A mechanism used to encrypt and decrypt data. a)Cryptography b)Algorithm c)Data flow d)None of these
5	Conventional cryptography also known as_____encryption. a)asymmetric-key b)logical-key c)symmetric-key d)None of these
6	RSA is named after the researchers. a) Rivest, Shamir, Adleman b) River, Shamir, Adleman c) Rivest, Shamus, Adleman d) Rivest, Shamir, Adlemar
7	Public key encryption uses or creates_____in its algorithm. a) A pseudo-random number b) A private key c) A public key d) All of these answers are correct
8	For p=11, q=17 and chose e=7. Apply RSA algorithm where PT =88 and thus find CT. a) 23 b)64 c)11 d)54
9	In public key crypto system_____keys are used for encryption and decryption. a) Same b)different c)Encryption keys d)None of the above
10	In trapdoor function, the functions are easy to go in_____ a)One direction b)Two directions c)All directions d)None of the above

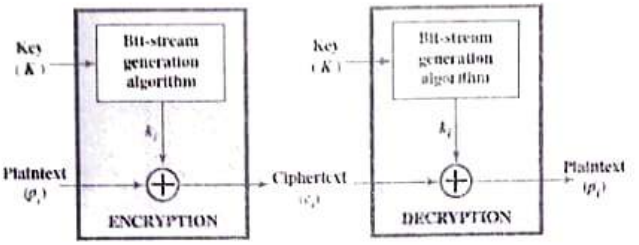
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I Internal Test Scheme and Solutions

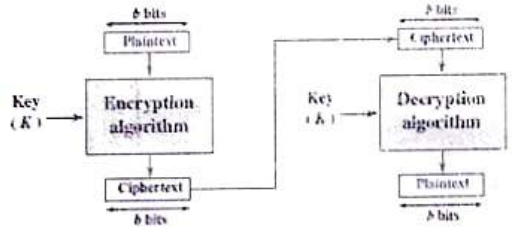
Semester: **VII A & B** Max. Marks:**50**

Sub Name: **Cryptography** Sub Code: **18CS744**

Qn. No.		Questions	Marks
1	a)	Differentiate between Stream Cipher and Block Cipher.	4



(a) Stream cipher using algorithmic bit-stream generator



(b) Block cipher

Figure 3.1 Stream Cipher and Block Cipher

	b)	User A and B exchange the key using Diffie-Hellman algorithm. Assume α=5 q=11 X_A=2 X_B=3. Find the value of Y_A, Y_B and K.	6

Sol'n

Given: $q = 11$, $\alpha = 5$, $X_A = 2$, $X_B = 3$

To find: Y_A, Y_B, K

i] $Y_A = \alpha^{X_A} \bmod q$

$= 5^2 \bmod 11$

$= 25 \bmod 11$

$\boxed{Y_A = 3}$

ii] $Y_B = \alpha^{X_B} \bmod q$

$= 5^3 \bmod 11$

$= 125 \bmod 11$

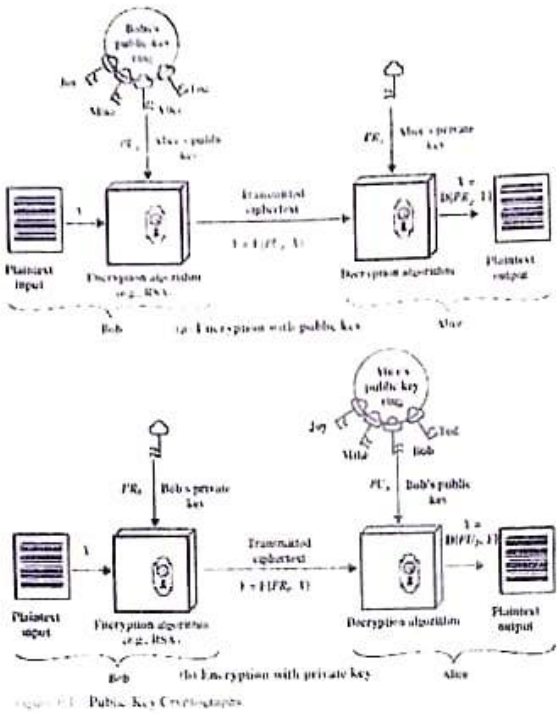
$\boxed{Y_B = 4}$

iii] $K = (Y_B)^{X_A} \bmod q$

$= 4^2 \bmod 11$

$\boxed{K = 5}$

2	a)	List out the principles of Public Key cryptography systems.	4



2M

2M

Explanation

Encryption using public key.

Encryption using private key.

	b)	Perform encryption and decryption using RSA algorithm for P=3, q=11, e=7 and M=31.	6

Soln

Given : $p = 3$, $q = 11$, $e = 7$, $M = 31$

$n = p \times q = 3 \times 11 = 33$ $\boxed{n = 33}$

$\phi(n) = (p-1)(q-1) = 2 \times 10 = 20$ $\boxed{\phi(n) = 20}$

2M

$\boxed{e = 7}$

PU = 7, 33

PR = 3, 33

$d = e^{-1} \bmod \phi(n)$

$de = 1 \bmod \phi(n)$

$(7 \times d) \bmod \phi(n) = 1$ $\boxed{d = 3}$

2M

Encryption

$C = M^e \bmod n$

$= 31^7 \bmod 33$

$\boxed{C = 4}$

Decryption :

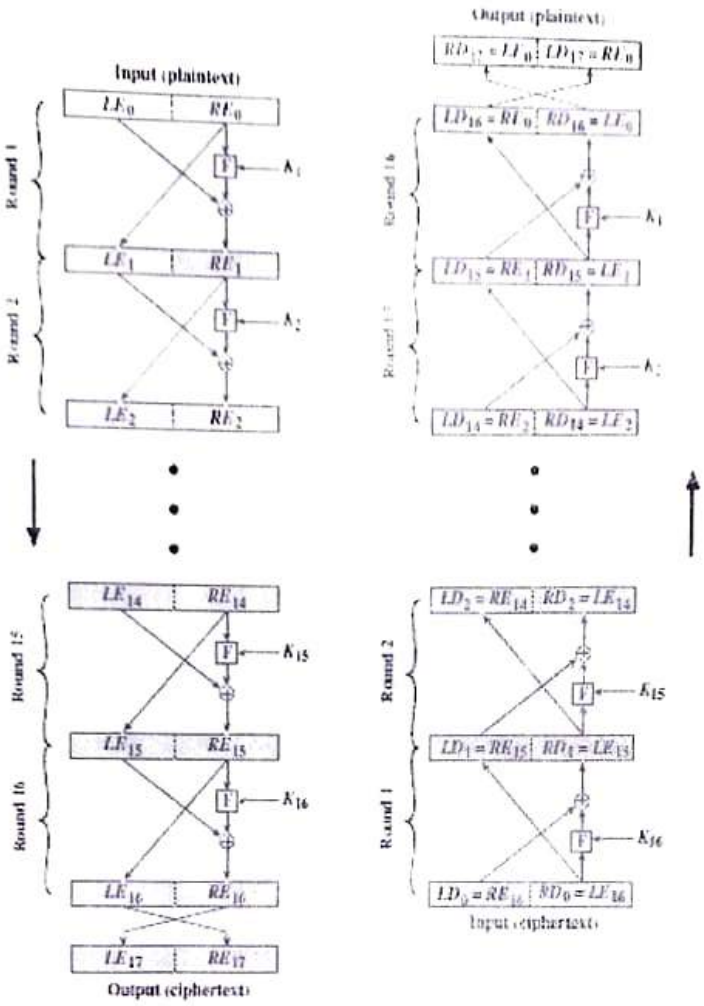
$M = C^d \bmod n$

$= 4^3 \bmod 33$

$\boxed{M = 31}$

2M

3	a)	Explain with a neat diagram Fiestel Cipher Structure.	4



Feistel Encryption and Decryption (n rounds)

2

* The left hand side of the above diagram depicts the structure proposed by Fiestal.
* The inputs to the encryption algorithm are a plaintext block of length 2w bits and a key K.
* The plaintext block is divided into 2 halves L_0 and R_0
* The two halves of the data pass through n rounds of processing and then combine to produce the ciphertext block.
* All rounds have the same structure.
  * Substitution.
  * Permutation.

2

	b)	Using Caesar Cipher Technique. Encrypt and decrypt the following message"Meet me after the class" k = 3	6

M → 12 C = 12+3 mod 26 → 15 (P)
e → 4 → 4+3 mod 26 → 7 (H)

e		H
t	(22)	W
m		P
e		H
a	(3)	D
f	(8)	I
t		W
e		H
r	20	U
t		W
h	10	K
e		H
c	5	F
l		O

4	a)	Define Cryptanalysis and write in detail about Brute-Force Attacks.	4

Cryptanalysis: Cryptanalytic attacks rely on the nature of the algorithm plus some knowledge on the general characterisitics of the PT & even some sample plaintext - ciphertext pairs — 2M

Brute-Force attack: The attacker tries every possible key on a piece of cipher text until an intelligible translation into plaintext is obtained. On average, half of all possible keys must be tried to achieve success. — 2M

	b)	Using the PlayFair techniques Encrypt the message "BALLOON" taking thekey as "MONARCHY".	6

M	O	N	A	R
C	H	Y	B	D
E	F	G	I/J	K
L	P	Q	S	T
U	V	W	X	Z

2M

BA is in same column B → A, A → X

LX is in different rows SU

LO is in different rows PM

ON in same row NA

CT : AX SU PM NA — 2M

→ Digraphs

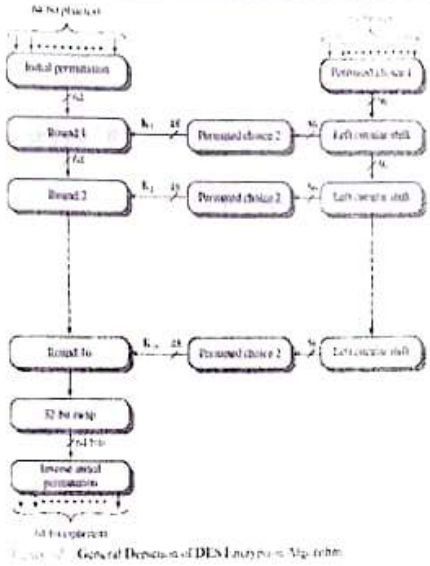
BA | LX | LO | ON — 2M

5	a)	With neat diagram explain the general depiction of DES algorithm.	4

DES algorithm
- DES Encryption.
- DES decryption.

DES Encryption : There are 2 inputs to the encryption function : the plaintext to be encrypted and key. Plain text must be 64bits & the key is 56bits in length. — 2

DES Decryption.



2

b) Consider a Diffie Hellman scheme with a common prime q=11 and aprimitive root α =2.

- Show that 2 is a primitive root of 11.

$2^1 \bmod 11 = 2 \quad 2^2 \bmod 11 = 4 \quad 2^3 \bmod 11 = 8 \quad 2^4 \bmod 11 = 5$
$2^5 \bmod 11 = 10 \quad 2^6 \bmod 11 = 9 \quad 2^7 \bmod 11 = 7 \quad 2^8 \bmod 11 = 3 \quad 2^9 \bmod 11 = 6$
$2^{10} \bmod 11 = 1$

6

2M

- If user A has public key Y_A=9, what is A's private Key?

$Y_A = \alpha^{X_B} \bmod 11$
$9 = 2^{X_B} \bmod 11$
$9 = 2^6 \bmod 11$

2M

- If user B has public key Y_B=3, what is the secret Key K shared withA?

2M

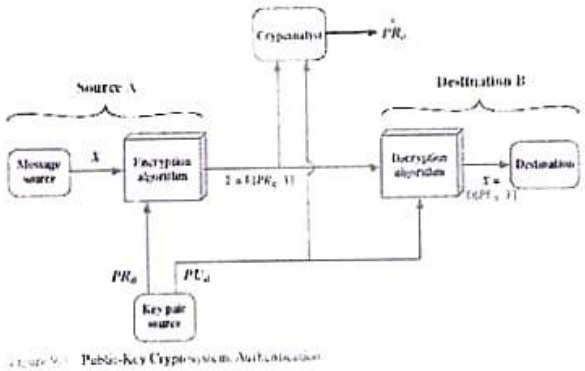
$K = 3^6 \bmod 11$
$= 3$

6 a) Differentiate between Conventional Encryption and Public KeyCryptosystem

4

Table 9.2 Conventional and Public-Key Encryption

Conventional Encryption	Public-Key Encryption
Needed to Work: 1. The same algorithm with the same key is used for encryption and decryption. 2. The sender and receiver must share the algorithm and the key. *Needed for Security:* 1. The key must be kept secret. 2. It must be impossible or at least impractical to decipher a message if the key is kept secret. 3. Knowledge of the algorithm plus samples of ciphertext must be insufficient to determine the key.	*Needed to Work:* 1. One algorithm is used for encryption and a related algorithm for decryption with a pair of keys, one for encryption and one for decryption. 2. The sender and receiver must each have one of the matched pair of keys (not the same one). *Needed for Security:* 1. One of the two keys must be kept secret. 2. It must be impossible or at least impractical to decipher a message if only one of the keys is kept secret. 3. Knowledge of the algorithm plus one of the keys plus samples of ciphertext must be insufficient to determine the other key.

	b)	Discuss the operation, diffusion and confusion with respect to P-box and S-box. Operation: operation of P-box and S-box Diffusion: In diffusion, the statistical structure of the plaintext is dissipated into long-range statistics of the ciphertext. Confusion: confusion refers to making the relationship between the ciphertext and the encryption key as complex as possible	6 2 2 2
7	a)	With a neat diagram explain Public Key Cryptosystem.  Public-Key Cryptosystem: Authentication Explanation: Authentication Confidentiality. Example	4 2M 2 M
	b)	Using Elgamal Cryptosystem, perform encryption and decryption for the values q=19, α=10, X_A=5, k=6. $Y_A = \alpha^{X_A} \bmod q = \alpha^5 \bmod 19 = 3$ Private Key = $X_A = 5$ Public Key = $\{q, \alpha, Y_A\} = \{19, 10, 3\}$ $k=6$, $K = (Y_A)^k \bmod q = 3^6 \bmod 19 = 729 \bmod 19 = 7$ $C_1 = \alpha^k \bmod q = \alpha^6 \bmod 19 = 11$ $C_2 = KM \bmod q = 7 \times 17 \bmod 19 = 119 \bmod 19 = 5$ (11, 5) is the ciphertext $K = (C_1)^{X_A} \bmod q = 11^5 \bmod 19 = 161051 \bmod 19 = 7$	6

K^{-1} is $7^{-1} \bmod 19 = 11$

Finally $M = C_2 K^{-1} \bmod 9 = 5 \times 11 \bmod 19 = 55 \bmod 19 = 17$

8	a)	Explain Diffie Hellman key exchange algorithm.	4

Diffie Hellman key exchange Algorithm used to exchange public and private key — 1

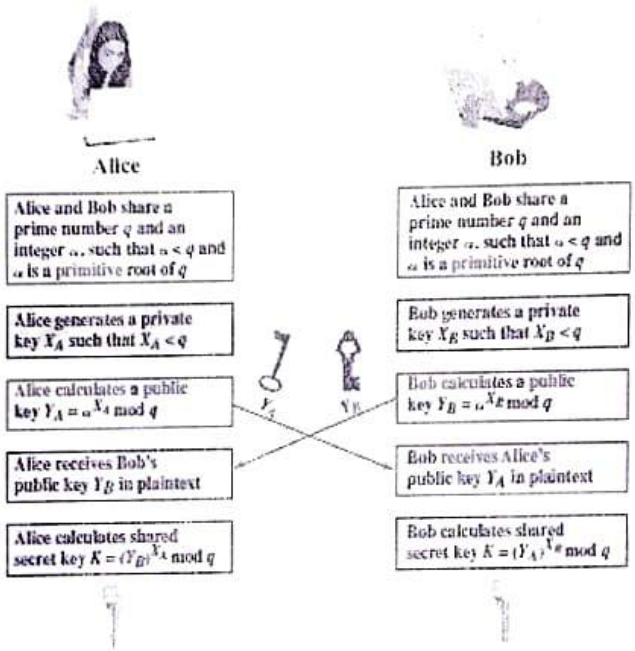


Figure 10.1 The Diffie-Hellman Key Exchange

3

	b)	Illustrate, the following using hill cipher technique where the block size=2 and key is 3 7 15 12 a) What is the cipher text corresponding to the plaintext (V W)? b) What is the plaintext corresponding to the cipher text (T Q)?	6

Soln

a) $C = K \cdot P \bmod 26$.

$= \begin{bmatrix} 3 & 7 \\ 15 & 12 \end{bmatrix} \begin{bmatrix} 21 \\ 22 \end{bmatrix} \bmod 26 = \begin{bmatrix} 9 \\ 7 \end{bmatrix} = JH$ $\boxed{C = JH}$ — 3

b) $P = K^{-1} C \bmod 26$.

$K^{-1} = \frac{1}{|K|} \bmod 26$. $\quad \text{adj } K = \begin{bmatrix} 12 & -7 \\ -15 & 3 \end{bmatrix} \quad |K| = -69$ — 3

9	a)	Explain Man-in-the-middle attack with an example.	5

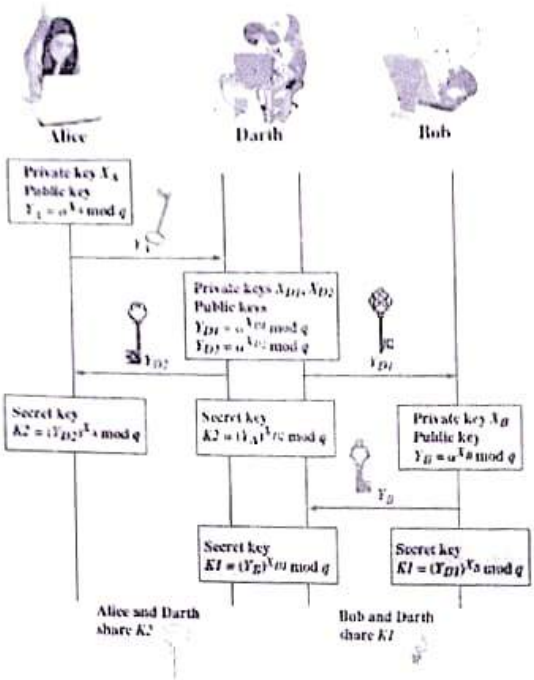


Figure 10.2 Man-in-the-Middle Attack

2·5

Explanation: Attacker prepares 2 private key X_{D1} & X_{D2}
Darth's interception between Alice & Bob
M: E (K2, M)
E (K1, M) & E (K1, M')

2·5

	b)	Encrypt the following message using the key = "DECEPTIVE" using Vigenere. Message= " we are discovered save yourself".	5

key : deceptive deceptive deceptive
PT : wearediscoveredsave yourself

Encrypt $C_i = (P_i + k_i \bmod m) \bmod 26$

Decrypt $P_i = (C_i - k_i \bmod m) \bmod 26$

positional values of d = 3, w = 22 ∴ $C_i = (3 + 22) \bmod 26$
$= 25 \Longrightarrow Z$

Apply for all.

CT: ZICVTWQNGRZGVTWAVZHCQYGLMGJ

10	a)	Explain Elgamal Cryptosystem process.	5

		Global Public Elements	2.5
		q — prime number	
		α — $\alpha < q$ and α a primitive root of q	
		Key Generation by Alice	
		Select private X_A — $X_A < q - 1$	
		Calculate Y_A — $Y_A = \alpha^{X_A} \bmod q$	
		Public key — $\{q, \alpha, Y_A\}$	
		Private key — X_A	
		Encryption by Bob with Alice's Public Key	
		Plaintext: — $M < q$	
		Select random integer k — $k < q$	
		Calculate K — $K = (Y_A)^k \bmod q$	
		Calculate C_1 — $C_1 = \alpha^k \bmod q$	
		Calculate C_2 — $C_2 = KM \bmod q$	
		Ciphertext: — (C_1, C_2)	
		Decryption by Alice with Alice's Private Key	
		Ciphertext: — (C_1, C_2)	
		Calculate K — $K = (C_1)^{X_A} \bmod q$	
		Plaintext: — $M = (C_2 K^{-1}) \bmod q$	
		The Elgamal Cryptosystem	
		1] Bob generates a random integer k.	2.5
		2] Bob generates a one-time key K using Alice's public key components Y_A, q and k.	
		3] Bob encrypts k using the public-key component α, yielding C_1. C_1 provides sufficient information for Alice to recover K.	
		4] Bob encrypts the plaintext message M using K.	
		5] Alice recovers K from C_1 using her private key.	
		6] Alice uses K^{-1} to recover the plaintext message from C_2	
	b)	Discuss the security issues of RSA algorithm.	5
		Five possible approaches to attacking the RSA algorithm :	1×5
		1] Brute force	
		2] Mathematical attacks	
		3] Timing Attacks	
		4] Hardware fault-based attack	
		5] Chosen ciphertext attacks	

Q.No.	Questions
1	RSA is named after the researchers. a) Rivest, Shamir, Adleman
2	Public key encryption uses or creates_____in its algorithm. d) All of these answers are correct
3	For p=11, q=17 and chose e=7. Apply RSA algorithm where PT =88 and thus find CT. c) 11
4	In public key crypto system_____keys are used for encryption and decryption. b) different
5	In trapdoor function, the functions are easy to go in_____ a) One direction
6	Which of the following properties are the characteristic properties of a block cipher technique which differs from stream cipher? c) Both a and b
7	Which of the following is not a type of symmetric-key cryptography technique? c) Diffie Hellman Cipher
8	Which of the following options correctly defines the Brute force attack b) Trying every possible key to decrypt the message
9	A mechanism used to encrypt and decrypt data. a) Cryptography
10	Conventional cryptography also known as_____encryption. c) symmetric - key.

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20MBAFM304

RNS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MBA & RESEARCH CENTRE
III SEM MBA FIRST CONTINUOUS INTERNAL EVALUATION – DECEMBER 2021
DIRECT TAXATION

Time: 90 Mts **Max. Marks: 50**

Note: Answer any TWO FULL Questions from Question No.1 to 3 & Question No. 4 is compulsory

Q No.	Questions	Marks	PO:CO:BT
1a	Distinguish between Average rate of Income tax and Maximum Marginal Rate.	3	1:3:4
1b	'Tax Evasion is illegal' Do you agree? How Tax evasion is differ from 'Tax Avoidance'?	7	2:1:5
1c	Mr. X a German national is appointed in India as a senior scientific officer on 1.4.2017. On January 31, 2018 he goes to Iron on deputation for a period of three years, but leaves his wife and children in India. On May1, 2019 he comes to India and takes with him his family on June30, 2019. He returns to India and joins his original job on 2nd January, 2021. Determine his residential status for the A.Y 2021-22	10	3:1:5
2a	Distinguish between Deductions and Exemption	3	1:1:4
2b	Explain the procedure of computing Taxable income.	7	2:1:5
2c	X furnishes the following particulars of his income earned during the previous year relevant to the A.Y 2021-22:	10	3:3:5

Particulars	Rs.
Interest on German Development Bonds ($\frac{2}{5}^{th}$ is received in India)	60000
Income from agriculture in Bangladesh, received there but later on Rs.50000 is remitted to India (agricultural activity is controlled from Bangladesh)	181000
Income from property in Canada received outside India (Rs.76000 is used in Canada for meeting educational expenses of X's daughter in USA & Rs.10000 is later on remitted to India)	86000
Income earned from business in Kampala (Uganda) which is controlled from Delhi (Rs.15000 is received in India)	65000
Dividend paid by a foreign company but received in India on April 10, 2020	46500
Past untaxed profit of 2008-09 brought to India in 2020-21	1043000
Profits from a business in Madras & managed from outside India	27000
Profits on sale of a building in India but received in Sri Lanka	1480000
Pension from a former employer in India, received in Rangoon	36000
Gift in foreign currency from a friend received in India on January 20, 2021	80000

Find out the gross total income of X, if he is (a) resident & ordinarily resident, (b) resident but not ordinarily resident, & (c) non-resident for the assessment year 2021-22.

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<table>
<tr><td>3a</td><td>State any six incomes chargeable to tax under Income from Business u/s 28</td><td>3</td><td>1:3:1</td></tr>
<tr><td>3b</td><td>Distinguish Between Capital Receipt and Revenue Receipt.</td><td>7</td><td>2:1:4</td></tr>
<tr><td>3c</td><td>(i) Draw a Income tax slab rates of an individual for all age categories for the A. Y 2021-22 as per Old Tax Regime. (6)
(ii) Mr. Rajashekar, aged about 69, working in a private Company, Mangalore furnishes to you the details of his Taxable Income of Rs. 15,80,000 (computed from all sources). Being an Assessing Officer of IT, you are required to assess his net tax liability for the A.Y 2021-22 assuming that his employer already deducted tax from his salary as TDS of Rs. 62270. (4)</td><td>10</td><td>3:3:5</td></tr>
<tr><td></td><td>Case Study</td><td></td><td></td></tr>
<tr><td>4.</td><td>Mr. Rakesh (45 years) is an Indian citizen. He leaves India for the first time on July 3, 2017 to meet his friends & relatives. He comes back on April 5, 2018 . Again he went to Australia on 10.10.2018 and comes to India on 20.03.2019. On 5.5.2020 he visited Singapore with his family for holiday trip and come back to India on 15.01.2021. He is not a tax payer for other Countries. He gives the following information regarding his income pertaining to the assessment year 2021-22.
<table>
<tr><th>Particulars</th><th>Rs.</th></tr>
<tr><td>Salary from an Indian company for rendering service in India</td><td>45000</td></tr>
<tr><td>Royalty from the Government of India (received outside India)</td><td>500000</td></tr>
<tr><td>Technical fees from a foreign company (received outside India & technical fees pertain to a project of the foreign company situated in India)</td><td>628000</td></tr>
<tr><td>Technical fees from an Indian company (received outside India & technical fees pertain to a project of the Indian company situated outside India)</td><td>824000</td></tr>
<tr><td>Dividend from an Indian company (received in India)</td><td>200000</td></tr>
<tr><td>Dividend from a foreign company (received outside India)</td><td>310000</td></tr>
</table>
From the information given above find out the Gross Total Income of Mr. Rakesh for the assessment year 2021-22.</td><td>10</td><td>3:1:5</td></tr>
</table>

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The Question paper and Scheme & solution is verified and found correct

Course & Code	Signature of Examiner/Paper setter	Signature of Reviewer/Member-BOE	Signature of HOD-MBA
Direct Taxation 20MBAFM304 Date of Test: 21.12.2021			
Date			

III SEM MBA FIRST CIE – DECEMBER 2021

DIRECT TAXATION
SCHEME & SOLUTIONS

Course Title: Direct Taxation **Course Code: 20MBAFM304**

Q No.	Answer Scheme	Marks
1a	For finding out the average rate of Income tax, we calculate income tax on total income. The amount so arrived at is divided by the total income and multiplied by 100. The result will be the average rate of income tax. Average rate of tax= Income tax on total income X 100 Total income Maximum Marginal Rate means the rate of IT applicable in relations to the highest slab of Income in the case of an individual, AOP or BOI as specified in the Finance Act of relevant year. The Maximum Marginal Rate for the highest slab of IT for the A.Y 2021-2022 is 30% **[Meaning 2 & Formula 1 Mark]**	**3 Marks**
1b	When a person reduces his total income by making false claims or by withholding the information regarding his real income, so that his liability is reduced, is known as tax evasion. The evasion is not only **illegal** but it is also immoral, anti-social and anti-national practice. Therefore under the direct tax laws provisions have been made for imposition of heavy penalty and institution of prosecution proceedings against tax evaders. WAYS OF TAX EVASION ➢ Unrecorded sales ➢ Claiming bogus expenses, bad debts and losses ➢ Charging personal expenses as business expenses ➢ Submission of bogus charitable donations for deduction u/s 80G ➢ Non-disclosure of income from 'Benami transactions' ➢ By showing excessive or bogus salary payments to near relatives ➢ By not showing taxable incomes in return of income	**4+3=7** **(4)**

TAX AVODANCE	TAX EVASION
1. TAX AVODANCE is legal.	1. TAX EVASION is illegal
2. In TAX AVODANCE, no penalty can be imposed.	2. In TAX EVASION, the person is liable for penalty & prosecution.
3. In TAX AVODANCE, black money is not generated, hence, it is not very harmful to the society	3. In TAX EVASION, black money is generated which is mostly used for unproductive purpose.

(3)

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c	**Determination of residential status of Mr.X for the A Y 2021-22** He fulfills one basic and none of the additional conditions and hence he is **not-Ordinary resident** during the P Y 2020-21. (Working is necessary to show) **[Working: 3 Marks , Conditions satisfied: 5 Marks, Decision: 2 Marks]**	
2a	**Exemptions**: In income, there are several elements that are tax-free. So, while calculating tax liability, the part of income that is exempted from tax is deducted from total income. One typical example of a tax exemption is Agricultural income. **Deductions**: After remove the tax-exempted elements from income; payer can further reduce the total gross income with the help of deductions. You can claim deductions through various investments or through expenses that can be claimed in various sections of the ITR.	**3 Marks** **(2+1)**
2b	Following procedures are to be followed for computing the Total Income. 1. Classify the income under each of the above 5 heads and then deduct the permissible deductions of the respective head from the above income. The balance amount will be the taxable income. 2. Make the total of taxable income of each head and the aggregate of all these incomes is called Gross Total Income. 3. From the GTI, deduct the permissible deductions under Sec. 80 (C) to 80 (U) of the Act for computing the Total Income. Ie., GTI-Deductions under 80 (c) to 80 U = Total Income 4. Gross amount of Income tax payable is then calculated on the total income according to the rates prescribed by the Finance Act for the relevant A.Y. (including Education cess) . From the Gross tax payable, TDS if any is to be deducted after deducting tax rebate u/s 87A. The balance is the net tax liability subject to any advance tax paid.	**4 + 3**
2.c	**Solution 18:**	**10 marks**

Computation of GTI of Mr. X for the A.Y 2021-22

SL No.	Particulars	OR	NOR	NR
1	Interest on German Development Bonds (two-fifths is received in India)	60000	24000	24000
2	Income from agriculture in Bangladesh, received there but later on Rs.50000 is remitted to India (agricultural activity is controlled from Bangladesh)	181000	-	-
3	Income from property in Canada received outside India (Rs.76000 is used in Canada for meeting educational expenses of X's daughter in USA & Rs.10000 is later on remitted to India)	86000	-	-
4	Income earned from business in Kampala (Uganda) which is controlled from Delhi (Rs.15000 is received in India)	65000	65000	15000
5	Dividend paid by a foreign company but received in India on April 10, 2020	46500	46500	46500
6	Past untaxed profit of 2008-09 brought to India	-	-	-

1 each

PNSTU-MBA

	in 2020-21				
7	Profits from a business in Madras & managed from outside India	27000	27000	27000	
8	Profits on sale of a building in India but received in Sri Lanka	1480000	1480000	1480000	
9	Pension from a former employer in India, received in Rangoon	36000	36000	36000	
10	Gift in foreign currency from a friend received in India on January 20, 2021	80000	80000	80000	
	GROSS TOTAL INCOME	**2061500**	**1758500**	**1708500**	

3.a

- Revenue profits from business or Professions
- Repayment of any customs or excise duty
- Perquisites arises out of Business/Profession
- Salary, interest, bonus, commission etc received by a partner from his Partnership firm except share of profit.
- Income from speculative transactions
- Profit and gains in Business or Profession.
- Compensation received in connection with termination of management, agency, business modifications, property received by the Govt etc.
- Any income derived by a trade/profession from specific services.
- Any compensation due/received
- Income of trade association
- Receipts in connection with foreign trade
- Any sum received under a Keyman Insurance Policy
- Any sum, whether received or receivable in cash or kind

(Consider any six items)

3 Marks

(Half mark each)

3.b

Capital Receipt	Revenue Receipt
1.A receipt on account of Fixed Capital is a Capital receipt	1. A receipt on account of Circulating Capital
2. A receipt in substitution of a source of income is a capital receipt Eg: Compensation received by an employee for the termination of his service	2. A receipt in substitution of an income is a revenue receipt. Eg: a reward received for his good services.
3. Sale proceeds of any asset used by a person is a capital receipt Eg: Computer	3. Sale proceeds of any assets kept for resale is a revenue receipt. Eg: Furniture kept for resale
4.Insurance money received for a capital asset is a capital receipt	4.Insurance money received for a trading asset is revenue receipt.
5.Any subsidy or grant received from the government for capital purchase is capital receipt	5.Any subsidy or grant received from the government for trading purpose is revenue receipt.

5 Marks

1 2 for eg

3c.

When total Income (Chargeable at normal rate)	Income Tax in Rs.	Surcharge	*Health & Education Cess
Does not exceed Rs. 2,50,000	Nil	Nil	Nil
Is greater than Rs. 2,50,001 & less than Rs. 5,00,000	(TI - Rs. 2,50,000) x 5%	Nil	4%

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Is greater than Rs. 5,00,001 & less than Rs. 10,00,000	[(TI - Rs. 5,00,000) x 20%] + 12,500	Nil	4%	
Is greater than Rs. 10,00,001	[(TI - Rs. 10,00,000) x 30%] + 1,12,500	Nil.	4%	

Tax rates in India for Other Individuals [Men & Women less than 60 years] (Old Tax Regime)

10 Marks

Tax rates in India for Resident Individual being Senior Citizen (60 to 80 years)

When total Income (Chargeable at normal rate)	Income Tax in Rs.	Surcharge	*Health & Education Cess
Does not exceed Rs. 3,00,000	Nil	Nil	Nil
Is greater than Rs. 3,00,001 & less than Rs. 5,00,000	5%	Nil	4%
Is greater than Rs. 5,00,001 & less than Rs. 10,00,000	20%	Nil	4%
Is greater than Rs. 10,00,001	30%	Nil	4%

5

Tax rates in India for Resident Individual being Super/Very Senior Citizen (above 80 years)

When total Income (Chargeable at normal rate)	Income Tax in Rs.	Surcharge	*Health & Education Cess
Does not exceed Rs. 5,00,000	Nil	Nil	Nil
Is greater than Rs. 5,00,001 & less than Rs. 10,00,000	[(TI - Rs. 5,00,000) x 20%]	Nil	4%
Is greater than Rs. 10,00,001	[(TI - Rs. 10,00,000) x 30%] + 1,00,000	Nil	4%

Slab rate of surcharge

Sl No.	Net Income Level	Rate of Surcharge
1	Up to Rs. 50 lakhs	Nil
2	Rs. 50 lakhs to 1 Crore	10%
3	Rs. 1 to 2 Crore	15%
4	Rs. 2 to 5 Crore	25%
5	Rs.5 Crore & above	37%

(7+3)

***Health & Education Cess is always calculate on the total of IT amount + Surcharge.**

Tax liability of Mr. Rajashekar for the A.Y 2021-22 is : Rs. 233090

4. He is **Ordinary Resident** as he fulfils one basic and both additional conditions. His GTI is as follows:

10 Marks

SL	Particulars	Rs.
1	Salary from an Indian company for rendering service in India	45000

(5+5)

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2	Royalty from the Government of India (received outside India)	500000
3	Technical fees from a foreign company (received outside India & technical fees pertain to a project of the foreign company situated in India)	628000
4	Salary from an Indian company for rendering service in India	824000
5	Royalty from the Government of India (received outside India)	200000
6	Technical fees from a foreign company (received outside India & technical fees pertain to a project of the foreign company situated in India)	310000
	GTI	**2507000**

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INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MBA & RESEARCH CENTRE
III SEM MBA SECOND CONTINUOUS INTERNAL EVALUATION – JANUARY 2022
DIRECT TAXATION

Time: 90 Mts **Max. Marks: 50**

Note: Answer any TWO FULL Questions from Question No.1 to 3 & Question No. 4 is compulsory

<table>
<tr><th>Q No.</th><th>Questions</th><th>Marks</th><th>PO:CO:BT</th></tr>
<tr><td>1a</td><td>What is Block of Assets?</td><td>3</td><td>1:3:2</td></tr>
<tr><td>1b</td><td>Enumerate the deductions expressly disallowed to a business in computing profits under the head “Income from Profession”</td><td>7</td><td>3:3:5</td></tr>
<tr><td>1c</td><td>Calculate the Business income of X from the following details of his P & L Account for the year ended 31.03.2021
<table>
<tr><th>Particulars</th><th>Rs.</th><th>Particulars</th><th>Rs.</th></tr>
<tr><td>General expenses</td><td>13400</td><td>Gross profit</td><td>315500</td></tr>
<tr><td>Bad debts</td><td>22000</td><td>Commission</td><td>8600</td></tr>
<tr><td>Advance tax</td><td>21000</td><td>Brokerage</td><td>37000</td></tr>
<tr><td>Insurance (Fire)</td><td>600</td><td>S. Debtors</td><td>2500</td></tr>
<tr><td>Salary to staff</td><td>26000</td><td>Bad debts recovered (earlier allowed as deduction)</td><td>11000</td></tr>
<tr><td>Salary to X</td><td>32000</td><td>Int on Debentures(non trade)</td><td>25000</td></tr>
<tr><td>Interest on overdraft</td><td>4000</td><td>Interest on deposit with a company (non trade)</td><td>13000</td></tr>
<tr><td>Int. on Loan to Mrs. X</td><td>42000</td><td></td><td></td></tr>
<tr><td>Interest on capital of X</td><td>23000</td><td></td><td></td></tr>
<tr><td>Depreciation</td><td>48000</td><td></td><td></td></tr>
<tr><td>Advt. Expenditure</td><td>7000</td><td></td><td></td></tr>
<tr><td>Contribution to employees RPF</td><td>13000</td><td></td><td></td></tr>
<tr><td>Net profit</td><td>160600</td><td></td><td></td></tr>
<tr><td>TOTAL</td><td>412600</td><td></td><td>412600</td></tr>
</table>
<u>Other information</u>:
(i) The amount of Dep. allowable is Rs. 37300 as per I.T rules. It includes Depreciation on permanent sign board.
(ii) Advertisement expenditure includes Rs. 3000 being the cost of permanent sign board fixed on office premises.
(iii) Income of Rs. 4500 accrued during the P.Y, is not recorded in the P & L Account.
(iv) X pays Rs.6000 as premium on own life insurance policy of Rs. 70000 (sum assured.)
(v) General expenses include a) Rs. 500 given to Mrs. X for a party in honour of a friend who has recently come from Canada. b) Rs. 1000 being contribution to a political party.
(vi) Loan was taken from Mrs. X for payment of arrears of income tax</td><td>10</td><td>3:3:5</td></tr>
</table>

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<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>2a</td><td>What is unabsorbed Depreciation? Give Eg</td><td>3</td><td>1:3:1</td></tr>
<tr><td>2b</td><td>“Cash system of Accounting is relevant to the calculation of Income from Profession” Justify</td><td>7</td><td>2:3:5</td></tr>
<tr><td>2c</td><td>From the following statement compute the Income from Profession of Dr. Kapoor for the year ending 31.03.2021.
<table>
<tr><th>EXPENSES</th><th>Rs.</th><th>INCOMES</th><th>Rs.</th></tr>
<tr><td>Client rent</td><td>36000</td><td>Visiting fees</td><td>45000</td></tr>
<tr><td>Electricity expenses</td><td>6000</td><td>Consultation fees</td><td>125000</td></tr>
<tr><td>Telephone expenses</td><td>6000</td><td>Sale of medicines</td><td>72000</td></tr>
<tr><td>Salary to staff</td><td>36000</td><td>Dividend</td><td>5000</td></tr>
<tr><td>Dep. on Surgical Equipment</td><td>6000</td><td></td><td></td></tr>
<tr><td>Purchase of Medicine</td><td>36000</td><td></td><td></td></tr>
<tr><td>Dep. on X-ray Machine</td><td>4000</td><td></td><td></td></tr>
<tr><td>Income tax</td><td>5500</td><td></td><td></td></tr>
<tr><td>Donation to Charity Fund</td><td>4000</td><td></td><td></td></tr>
<tr><td>Motor car expenses</td><td>9600</td><td></td><td></td></tr>
<tr><td>Dep. on car</td><td>4800</td><td></td><td></td></tr>
<tr><td>Net Income</td><td>93100</td><td></td><td></td></tr>
<tr><td></td><td>247000</td><td></td><td>247000</td></tr>
</table>
Additional information:

Electricity expenses include domestic bill of Rs. 2500
Half of motor car expenses are for professional use.
Telephone Exp include 40% for personal use
Opening stock of medicines Rs. 6000 and closing stock Rs.4000
</td><td>10</td><td>3:3:5</td></tr>
<tr><td>3a</td><td>Identify the different types of assets eligible for Depreciation.</td><td>3</td><td>2:3:3</td></tr>
<tr><td>3b</td><td>Briefly explain the various exceptions to the charging of depreciation.</td><td>7</td><td>3:3:5</td></tr>
<tr><td>3c</td><td>XYZ limited ,a manufacturing company owns the following assets as on April 1 2020
<table>
<tr><td>Assets</td><td>Rate of depreciation</td><td>WDV On 1-4-2020</td></tr>
<tr><td>Plant A</td><td>30%</td><td>Rs. 200000</td></tr>
<tr><td>Plant B</td><td>15%</td><td>Rs. 406000</td></tr>
<tr><td>Plant C</td><td>15%</td><td>Rs 1470000</td></tr>
<tr><td>Plant D</td><td>30%</td><td>Rs 20000</td></tr>
</table>
It has purchase the following assets on 10.3.2021
<table>
<tr><td>Assets</td><td>Rate of depreciation</td><td>Cost price</td></tr>
<tr><td>Plant E</td><td>30%</td><td>Rs 800000</td></tr>
<tr><td>Plant F</td><td>15%</td><td>Rs 200000</td></tr>
</table>
It has sold the following plants during previous year 2020-2021
<table>
<tr><td>Assets</td><td>Rate of depreciation</td><td>Sales consideration</td><td>Expenses on transfer</td></tr>
<tr><td>Plant C</td><td>15%</td><td>Rs 2000000</td><td>Rs 20000</td></tr>
<tr><td>Plant A</td><td>30%</td><td>Rs 800000</td><td>Rs 2000</td></tr>
</table>
Determine the amount of depreciation and capital gain for the AY</td><td>10</td><td>3:4:5</td></tr>
</table>

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	2021-22. The company **is not eligible** for additional depreciation.		
4.	**Case Study** Mr.X of Mumbai submits the following Trading and P& L A/c for the year ended 31.3.2021. He is also in employment with the cinema company in Mumbai. Compute his gross total income according to the provisions of IT act 1961 for the A.Y. 2021-22	10	3:4:5

Trading and P&L A/c for the year ended 31-3-2021

Opening Stock	60000	Sales	620000
Purchase	390000	Closing stock	80000
Freight	15000		
Gross profit c/d	235000		
	700000		**700000**
Salaries & Wages	14800	Gross profit b/d	235000
Rent and taxes	3800	Dividend on shares (gross)	2000
Household expenses	2400	Rent from building let out	4800
Income tax	600		
Postage and telegrams	400		
Donations	500		
Life Insurance premium	1800		
Audit fees	200		
Reserve for doubt debt	680		
Bad debts	420		
Misc. expenses	600		
Depreciation	500		
Net profit	215100		
	241800		**241800**

The following information is also available

i. He has received salary of Rs. 62000 from the cinema company in Mumbai and has contributed 15% of his salary towards Recognized PF.
ii. Purchases include Rs. 5000 advance to suppliers in March 2021 against goods to be delivered in April 2021.
iii. Rent and taxes include Rs. 1800 being municipal taxes paid for the building let out.
iv. The Life insurance policy is for Rs. 15000
v. Donation is paid to the charitable institution recognized u/s 80G of IT Act 1961.
vi. Miscellaneous expenses include Rs. 400 being the purchase of books for his employment
vii. Depreciation permissible is Rs. 400.

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DEPARTMENT OF MBA & RESEARCH CENTRE

The Question paper and Scheme & solution is verified and found correct

Course & Code	Signature of Examiner/Paper setter	Signature of Reviewer/Member-BOE	Signature of HOD-MBA
Direct Taxation 20MBAFM304 Date of Test: 18.01.2022			
Date			

III SEM MBA FIRST CIE – DECEMBER 2021

DIRECT TAXATION
SCHEME & SOLUTIONS

Course Title: Direct Taxation **Course Code: 20MBAFM304**

Q No.	Answer Scheme	Marks
1a	Block of assets refers to those assets, which comes under the same category with same rate of depreciation. Block of Assets refers to group of assets, falling within a class of assets comprising: Tangible assets, being Buildings, Machinery, Plant or furniture Intangible assets, being know-how, patents, copyrights, trademarks, Licences, franchises or any other business or commercial rights of similar nature, acquired on or after 1.4.1998 (wef 1.4.2021 good will of a business or profession is excluded from intangible assets) in respect of which the same percentage of depreciation is prescribed. Eg: • Tangible assets with the same rate of depreciation will be considered as a Block. • Intangible assets with same rate of depreciation will be considered as Block.	**3 Marks**
1b	1. Expenses on Advertisement in any Souvenir published by political parties. 2. Payments made outside India OR in India to a Non-resident OR a Foreign company-On which TDS has not been deducted. 3. Any payment to a resident, on which tax is deductible at source and such tax has not been deducted OR after deduction has not been paid on or before the due date of filing the return of income, 30% of such sum shall not be allowed as a deduction. 4. Wealth tax, Income tax etc., 5. Salaries payable outside India OR to a Non-resident on which TDS has not been deducted 6. Payment to PF etc/ 7. Tax paid by the employer voluntarily on the value of perquisites provided to employees.	**1X7=7**
c	Income from Business Rs. 260300	**10**
2a	It refers to that part of depreciation, which cannot be allowed in a particular P.Y due to shortage of profit or of no profit. This can be carried forward and set-off from any	**3 Marks (2+1)**

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	income until it is fully written-off. Eg: Total amount of depreciation 5000 Dep. charged in the current year 2000 Unabsorbed Depreciation 3000 Rs. 3000 can be carried forward & it can be fully write it off	
2b	In the case of cash system of accounting, on the other hand, a record is kept of actual receipts and actual payments of a particular year. If books of account are kept by an assessee on the basis of cash system of accounting, income collected during the previous year is taxable whether it relates to the previous year or a year preceding or following the previous year. Similarly, expenditure actually paid during the previous year is deductible irrespective of the fact whether it relates to the previous year or some other year(s). In order to further clarify the same principle, section 43(2) defines the word "Paid", to mean actually paid or incurred according to the method of accounting upon the basis of which the profits or gains are computed under the head "Profits and gains of business or profession"	**7**
2.c	Income from Profession Rs. 107700	**5+5**
3.a	Assets Eligible for Depreciation [Sec 32(i)] A. Tangible Assets ▪ Building ▪ Plant & Machinery ▪ Furniture B. Intangible Assets (acquired on or after 1.4.1998) ▪ Know-how ▪ Patents ▪ Copyrights ▪ Trademarks ▪ Licences ▪ Franchises ▪ Any other business or commercial rights of similar nature	**3 Marks** **(Half mark each)**
3.b	**Exceptions:** 1. No depreciation is admissible where WDV has been reduced to Zero, though the block of assets does not cease to exist on the last day of the P.Y. 2. If a block of assets ceases to exist or if all assets of the block have been trensferred and the block of assets is empty on the last day of the P.Y, no depreciation is admissible in such case. 3. If an imported car was acquired during 1.3.1975 and 31.3.2001, depreciation is not admissible. If, however, such imported car is used in the business of running it on hire for tourist or for the purpose of business or profession outside India, then dep is admissible at the actual rate. 4. In the case of transfer of depreciable assets because of succession amalgamation, business reorganisation or demerger in the P.Y., depreciation is first calculated as if there is no transfer of depreciable assets and the quantum of depreciation so calculated shall be apportioned between the predecessor and successor in the ratio of number of days for which the assets are used by them during the P.Y. 5. If in the first year (in which an asset is acquired), it is put to use for less than 180 days, depreciation is available at half of the normal rate.	**5 Marks + 2 for eg**
3c	Rs.66000+11400=77400 Capital Loss= 2000+20000=22000	**10 Marks**

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4.	GTI= Rs.237680	**10**

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USN										

20MBAFM304

INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MBA & RESEARCH CENTRE
III SEM MBA THIRD CONTINUOUS INTERNAL EVALUATION – FEBURARY 2022
DIRECT TAXATION

Time: 90 Mts **Max. Marks: 50**

Note: Answer any TWO FULL Questions from Question No.1 to 3 & Question No. 4 is compulsory

Q No.	Questions	Marks	PO:CO:BT
1a	Identify any six assets does not include under the term 'Capital asset'	3	1:4:4
1b	Explain the deductions u/s 54, 54B and 54F in brief	7	3:4:5
1c	Mr. Hari retires on 15th October 2020 from a Non-Government Organization, after serving 30 years and 7 months. He gets Rs. 3,80,000 as gratuity. His salary details are given below; F.Y. 2020-21 | Basic Rs. 16000 p.m | DA 50% of Salary (40% part of retirement benefits) F.Y.2019-20 | Basic Rs. 15000 p m | DA 50% of Salary (40% part of retirement benefits) Determine his taxable gratuity if the Organization is not covered by the Payment of Gratuity Act 1972.	10	5:3:5
2a	Who is specified Employee as per IT Act of 1961?	3	1:3:1
2b	Mr. Rahul retired from ACA Ltd., on 30th June 2019. He gets pension of Rs.4000 per month up to 31st December 2020. On 1st Jan 2021, he gets 40 % of pension commuted for Rs. 52800. Calculate taxable Pension. What difference it will make if he gets Rs. 45000 as Gratuity along with pension?	7	5:4:5
2c	Find out the amount that shall be included in the income under the head salaries in each of the following cases: a. Basic Pay Rs. 20,000 DP 10% of Basic Pay, Commission based on Fixed percentage of Turnover Rs. 1,20,000 for the whole year. HRA Rs. 5,000p.m Actual rent paid Rs. 4,000p.m., House situated in Agra. b. Basic Pay Rs. 30,000 DA @ 10% of Basic Pay, HRA Rs. 5000p.m, Actual rent paid Rs. 7000p.m., House situated in Mathura. c. Basic Pay Rs. 20,000 p m. DA @ 10% of Basic Pay, HRA Rs. 2000p.m, and actual rent paid Rs. 5,000p.m., House situated in Delhi.	10	3:4:5
3a	State any six fully exempted allowances	3	2:3:2
3b	Sri Om Prakash was manager in a company. He sought premature retirement from service on 1.11.2020 after completing 25 years of service. From 1.8.2019 his pay scale was Rs. 18000-900-24300 and he was getting DA of Rs.1800 p.m which was treated as salary for the purpose of retirement benefits. He had 7 months earned leave to his credit (on the basis of 30 days per year) which was approved; hence he was paid Rs. 132300 as salary and Rs. 12600 as DA. Compute the amount exempt regarding encashment of earned leave for the A.Y 2021-22.	7	5:4:5

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<table>
<tr><td>3c</td><td>Mr. Hanuman submits the following particulars about sale of assets during the year 2020-21:
<table>
<tr><th>Particulars</th><th>Jewellery (Rs.)</th><th>Plot (Rs.)</th><th>Gold (Rs.)</th></tr>
<tr><td>Sale price</td><td>7,00,000</td><td>18,24,000</td><td>5,00,000</td></tr>
<tr><td>Expenses on sale</td><td>Nil</td><td>24,000</td><td>Nil</td></tr>
<tr><td>Cost of acquisition</td><td>1,29,000</td><td>2,26,000</td><td>1,48,000</td></tr>
<tr><td>Year of acquisition</td><td>2007-08</td><td>2004-05</td><td>2009-10</td></tr>
<tr><td colspan="4">He has purchased a house for Rs.15,00,000 on 1.3.2021. Calculate the amount of taxable capital gain if CII for 2004-05, 2007-08 2009-10 and 2020-21 are 113, 129, 148 and 301 respectively.</td></tr>
</table></td><td>10</td><td>5:5:5</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>4.</td><td>Case study-Compulsory
Mr.Chandan is an employee of a textile company, Kanpur since 2010. He has submitted the following particulars of his income for the F Y 2020-21.
<table>
<tr><td>i</td><td>Net basic salary Rs.4,00,000 after deduction of contribution to RPF Rs.72,500 and rent of bungalow @ 10% of basic salary.</td></tr>
<tr><td>ii</td><td>DA Rs. 1000 p m (Rs. 200 p m enters into retirement benefits</td></tr>
<tr><td>iii</td><td>Education allowance for two children @ Rs.150 p m per child</td></tr>
<tr><td>iv</td><td>Commission of sales @ 1% Rs.10000</td></tr>
<tr><td>v</td><td>Entertainment allowance Rs. 700 p m</td></tr>
<tr><td>vi</td><td>Travelling allowance for his official tours Rs.30000, Actual expenses on tour amounted to Rs. 22000</td></tr>
<tr><td>vii</td><td>He resides in the bungalow of the Company. Its fair rent is Rs. 10000 p m. A watchman and Cook have been provided by the Company at the bungalow who were paid Rs. 4000 p ,m each.</td></tr>
<tr><td>viii</td><td>He has been provided with a large Motor Car for his official as well as personal use. The running and maintenance costs are borne by the Company.</td></tr>
<tr><td>ix</td><td>Employers contribution to RPF is Rs.47500 and the interest credited to this fund at 10% rate amounted to Rs.50000</td></tr>
</table>
Compute his Income from Salaries for the A Y 2021-22</td><td>10</td><td>3:5:5</td></tr>
</table>

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The Question paper and Scheme & solution is verified and found correct

Course & Code	Signature of Examiner/Paper setter	Signature of Reviewer/Member-BOE	Signature of HOD-MBA
Direct Taxation 20MBAFM304 Date of Test: 18.02.2022			
Date			

III SEM MBA THIRD CIE – FEBURARY 2022

DIRECT TAXATION
SCHEME & SOLUTIONS

Course Title: Direct Taxation **Course Code: 20MBAFM304**

Q No.	Answer Scheme	Marks
1a	i. Commercial goods ii. Movable assets for personal use iii. Rural Agricultural Land iv. Gold Bonds v. Special bearer Bonds vi. Gold Deposit Bonds	1/2 Mark each point
1b	Sec 54 – Sale of Residential house and purchase of new residential house under Capital gain amount. Sec 54B – Sale of Urban Agricultural land and purchase of new Urban or Rural Agricultural Land under Capital gain amount. Sec 54F – Sale of Capital Assets other than Residential house and purchase of new residential house under Capital gain amount.	**3+2+2**
1c	**Computation of Taxable Gratuity of Mr. Hari if the Organization is not covered by the PGA1972**	

Particulars	Rs.	Rs.	
Actual amount Received as Gratuity		3,80,000	**1**
Less least of the following is exempted (a) Actual amount received	3,80,000		**1**
(b) 15 days Ave. Salary X No. of service period completed 15 days Ave. Salary = Ave. salary of last 10 months X 15 / 30 = 18720 X 15 / 30 = 9360 x 30	**2,80,800**		**6**
Max limit Rs.	20,00,000	2,80,800	**1**
Taxable Gratuity		**99,200**	**1**

Working:
Salary = Basic + DP+ Fixed % age of commission
Service period= No Excess of 6 months will be the one full year (No part of the year will be considered)
10 months Ave. Salary = Dec 2019 to March 2020 15000 X 4 = 60000

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	April 2020 to sept 2020 16000 X 6 = 96000 Total Basic 156000 DP: 156000 X 50 / 100 = 78000 X 40 / 100 = 31200 100 187200 Ave Salary = 187200/10 = **18720**	
2a	Specified employee is one who fulfils any one of the following conditions. Viz., a) A Director-Employee :An assessee must be an employee as well as director either on full time or part time basis b) Employee having substantial interest in the employer company: He must having at least 20% of voting rights (owned Equity shares) in his employer company c) Income exceeds Rs. 50000: His total monetary benefits under the head salary either from one or more than one employer should exceed Rs. 50000 excluding perquisites but after deductions u/s 16(i) 16(ii) & 16(iii)	**3 Marks (1x3)**
2b	**(If he receives gratuity)**	**7**

Particulars	**Rs.**
Monthly or regular pension (1.4.2020 to 31.12.2020) = 9 months x 4000	**36000**
60% on 4000 will receive from 1.1.2021 to 31.3.2021 = 3 month x 2400	**7200**
Total monthly Pension taxable	**43200**
if he receives gratuity Full Pension = 52800 /40*100 1/3 exempted = 132000 x 1/3 = 44000 Amount received 52800– 44000	**1,32,000** **8800**
Total pension taxable	**1,84,800**
Total taxable pension (commuted and Un commuted)	**52000**

(If he does not receives gratuity)

Particulars	**Rs.**
Monthly or regular pension (1.4.2020 to 31.12.2020) = 9 months x 4000	**36000**
60% on 4000 will receive from 1.1.2021 to 31.3.2021 = 3 month x 2400	**7200**
Total monthly Pension taxable	**43200**
if he receives gratuity Full Pension = 52800 /40*100 1/2 exempted = 132000 x 1/2 = 66000 Amount received 52800 – 66000	**1,32,000** **NIl**
Total pension taxable	**Nil**
Total taxable pension (commuted and Un commuted)	**43200**

2.c	**i)** **Computation of taxable HRA of an assessee for the A Y 2021-22**		**3+3+3+1**
	Particulars		
	Actual HRA Received (5000 x 12)		**60,000**
	LESS least of the following is exempted		
	(a) Excess of Rent paid over 10% of salary (Rent paid-10% of salary)4000 x 12 = 48000 - 38400	**9600**	
	(b) In case of Metro cities-50% of salary and other cities -40% of salary= 40% on 384000	153600	
	(c) Actual HRA received	60000	9600
	Taxable HRA =		**50400**

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WN-1 10% of Salary = 240000+24000+120000= 384000
10% of Salary = 38400

ii)

Computation of taxable HRA of anassessee for the A Y 2021-22

Particulars	Rs.	Rs.
Actual HRA Received (5000 x 12)		**60,000**
LESS least of the following is exempted		
(a) Excess of Rent paid over 10% of salary (Rent paid-10% of salary)84000-36000	**48000**	
(b) In case of Metro cities-50% of salary and other cities -40% of salary= 40% on Rs. 3,60,000	1,44,000	48,000
(c) Actual HRA received	60,000	
Taxable HRA =		**12,000**

WN-1 Calculation of 10% of salary
Salary = 3,60,000
10% of salary = 36000

iii)

Computation of taxable HRA of an assessee for the A Y 2021-22

Particulars	Rs.	Rs.
Actual HRA Received (2000 x 12)		**24,000**
LESS least of the following is exempted		
(a) Excess of Rent paid over 10% of salary (Rent paid-10% of salary)5000 x 12 = 60,000- 24000	36000	
(b) In case of Metro cities-50% of salary and other cities -40% of salary= 50% of 2,40,000	1,20,000	
(c) Actual HRA received	**24,000**	24,000
Taxable HRA =		**NIL**

WN-1 Calculation of 10% of salary
Salary = 2,40,000
10% of salary = 24000

3.a

a. Foreign Allowance
b. Sumptuary Allowance payable to High Court & Supreme court Judges of India OR payable to serving chairman/members of UPSC
c. Allowance from U.N.O to its employees.
d. Per-diem Allowance
e. Allowance received by a teacher/researcher from a SAARC member state.
f. Allowance to retired Chairman and retired members of UPSC

3 Marks

(Half mark on each point)

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3.b

Computation of taxable leave salary of Mr. Omprakash for the A Y 2021-22

Particulars	Rs.	Rs.
Actual leave salary received		144900
LESS least of the following is exempted		
(a) Last 10 months salary (preceding the retirement period) (126000+56700+18000)	200700	
(b) Average salary on 10 Months X Approval period in years (20070 x 7 Months)	140490	
(c) Maximum of Rs. 3,00,000	300000	
(d) Actual leave salary received	144900	140490
Taxable Leave Salary		**4410**

5 Marks + 2 for eg

3c

Computation of Capital gain of Mr. Hanuman for the A. Y 2021-22

Particulars	Jew.	Plot	Gold
Sale consideration	7,00,000	18,24,000	5,00,000
Less Exp on Transfer	Nil	24,000	Nil
Net Sales Consideration	7,00,000	18,00,000	5,00,000
LESS ICOA 129000*301/129	3,01,000		
LESS ICOA 226000*301/113		6,02,000	
LESS ICOA 148000*301/148			3,01,000
LTCG	3,99,000	11,98,000	1,99,000
Calculation of Taxable LTCG			
Total LTCG (399000+1198000+199000)			17,96,000
Net consideration=7,00,000+18,00,000+5,00,000=		30,00,000	
As per rule amount eligible for deduction u/s **54F** (Proportionally) 1796000*1500000/3000000			8,98,000
Taxable Capital Gain			**8,98,000**

10 Marks

4. Case Study:

Computation of taxable salary of Mr. Chandan for the A Y 2021-22

Particulars	Rs.	Rs.	Rs.
Basic Salary: Salary received		4,00,000	
Contribution to RPF		72,500	
Amount dedicated @ 10% of basic salary 472000/90*100 525000*10%		52500	5,25,000
DA	800x12	9600	
DP	200x12	2400	12,000
Children Education allowance (3600-2400)			1,200
Commission of sales			10,000
Entertainment allowance (700x12)			8,400
Travelling allowance (30000-22000)			8,000
RFA: As per rule 15% of salary			

10

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	(525000+2400+10000+1200+8400+8000=555000)				
	15% on 5,55,000		83250		
	Less Employee contribution		52,500	30,750	
	Watchman		4000x12	48,000	
	Cook		4000x12	48,000	
	Motor car (Rs.2400x12)			28,800	
	Excess of 12% over salary(Basic+DP+Commn)				
	525000+24000+1000	559000			
	122% on 559000	67080			
	_Actual contribution	47500			
	Excess			0	
	Interest on PF in excess of 9.5%	50000			
		47500		2,500	
	GROSS SALARY			7,22,650	
	Less Deduction u/s 16(i)			50,000	
	Taxable Salary			**6,72,650**	

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II Semester – I Test

Mathematical Foundation for Computer Applications (20MCA14)

Scheme and Solution

1a) Powerset, subset (2+1)

Powerset is the set containing or collection of possible subsets of a set including null set.

subset is a set that contains one or more equal elements of that set in it. It is contained inside a set.

1b) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ (2+2)

$\Rightarrow x \in A \cup (B \cap C)$

$\Rightarrow x \in A$ or $(x \in B$ and $x \in C)$

$\Rightarrow (x \in A$ or $x \in B)$ and $(x \in A$ or $x \in C)$

$\Rightarrow x \in (A \cup B) \cap (A \cup C)$

$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

$= x \in A \cap (B \cup C)$

$= x \in A$ and $(x \in B)$ or $x \in C)$

$\Rightarrow (x \in A$ & B or $x \in A \cap C)$

$\Rightarrow x \in (A \cap B) \cup (A \cap C)$

1c) Cardinality of set specifies the number of elements in a finite set. (1+2)

It is also called as order of set.

$A = \{2, 3, 4, 5, 6, 7, 8, 9\}$

$|A| = 8$

$B = \{a, e, i, o, u\}$

$|B| = 5.$

2 a) (05)

U : students in the class

A : students are studying C++

B : students who are studying UNIX

A∩B : Both languages

$|A \cup B| = ?$

$|\overline{A \cup B}| = 9$

$|U| = 52, \quad |A| = 30, \quad |B| = 28, \quad |A \cap B| = 13$

$|A \cup B| = 30 + 20 - 13$

$= 45$

$|\overline{A \cup B}| = U - |A \cup B|$

$= 52 - 45$

$= 7$

∴ There are 7 numbers who studies neither of three languages.

2 b) i) $(A \cup B')' = A' \cap B'$ (02)

$x \in (\overline{A \cup B})$

$x \notin (A \cup B)$

$x \notin A$ and $x \notin B$

$x \in A'$ and $x \in B'$

$x \in A' \cap B'$

ii) $(\overline{A \cap B})' = A' \cup B'$ (03)

$= x \in (A \overline{\cap B}) \Rightarrow x \notin A \cap B$

$\Rightarrow x \notin A'$ or $x \in B'$

$\Rightarrow x \in A' \cup B'$

3a) Set :- a well-defined collection of objects. (1½ x 4)

ex:- $A = \{a, b, c, d\}$

Empty set :- a set which has no element.

ex:- $A = \{\}$

Universal Set :- is a set which contains all the elements. It is denoted by U

Ex:- $U = \{1, 2, 3, 4, 5, 6 \ldots\}$

Singleton Set :- if a set which contains only one element

ex:- $A = \{1\}$.

3b) Union of sets (02)

Let A and B are 2 sets, then elements of A or B is called union of sets.

ex:-

$A = \{1, 2, 3\}$, $B = \{4, 5, 6\}$

$A \cup B = \{1, 2, 3, 4, 5, 6\}$.

Intersection of sets:- (02)

The elements which contain on both A & B is called intersection of sets.

ex:- $A = \{1, 2, 3\}$, $B = \{3, 4, 5\}$

$A \cap B = \{3\}$.

4a) $|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|$

Consider $|A \cup B \cup C| = |A \cup D|$ where $D = B \cup C$ (06)

$\Rightarrow |A| + |D| - |A \cap D|$

$\Rightarrow |A| + |B \cup C| - |A \cap (B \cup C)|$

$\Rightarrow |A| + |B| + |C| - |B \cap C| - |(A \cap B) \cup (A \cap C)|$

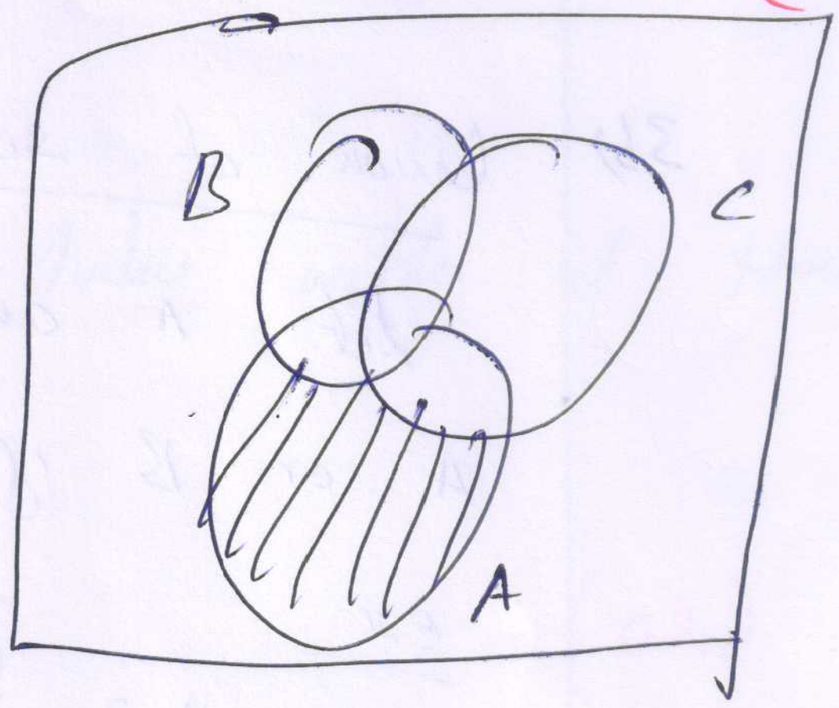
$\Rightarrow |A| + |B| + |C| - |B \cap C| - |(A \cap B) + (A \cap C) - (A \cap B) \cap (A \cap C)|$

$\Rightarrow |A| + |B| + |C| - |B \cap C| - |A \cap B| - |A \cap C| + |(A \cap B) \cap (A \cap C)|$

$\Rightarrow |A| + |B| + |C| - |A \cap B| - |B \cap C| - |C \cap A| + |A \cap B \cap C|$ (04)

4b) $|A - B - C| = |A| - |A \cap B| - |A \cap C| + |A \cap B \cap C|$

From figure



$|A - B - C| =$

$\Rightarrow |A \cup B \cup C| - |B \cup C|$

$\Rightarrow \{[|A| + |B| + |C| - |A \cap B| - |B \cap C| - |A \cap C| + |A \cap B \cap C|]$

$- [|B| + |C| - |B \cap C|]$

$\Rightarrow |A| - |A \cap B| - |A \cap C| + |A \cap B \cap C|$

p	q	$p \vee q$	$p \hookrightarrow q$	$(p \vee q) \wedge (p \hookrightarrow q)$
T	T	T	T	T
T	F	T	F	F
F	T	T	T	F
F	F	F	T	F

(03)

5b)

p	q	$p \wedge (q \hookrightarrow r)$
T	T	T
T	T	F
T	F	T
T	F	F
F	T	T
F	T	F
F	F	T
F	F	F

(03)

a)

p	q	r	$q \vee r$	$p \hookrightarrow (q \vee r)$
T	T	T	T	T
T	T	F	T	T
T	F	T	T	T
T	F	F	F	F
F	T	T	T	T
F	T	F	T	T
F	F	T	T	T
F	F	F	F	T

(02)

b) $p \hookrightarrow (q \vee r)$

p	q	r	$q \vee r$	$p \hookrightarrow (q \vee r)$
T	T	T	T	T
T	T	F	T	T
T	F	T	T	T
T	F	F	F	F
F	T	T	T	T
F	T	F	T	T
F	F	T	T	T
F	F	F	F	T

(02)

$$\Leftrightarrow \neg P \vee Q$$

$$\Leftrightarrow (B \wedge d\bot) \wedge \top$$

$$\Leftrightarrow (\top P \vee Q)$$

$$\Leftrightarrow (F \wedge \top Q) \vee (\top P \vee Q)$$

$$\Leftrightarrow (P \wedge (\top P \wedge \top Q) \vee d) \Leftrightarrow (B \wedge d\bot)$$

$$\Leftrightarrow ((\top P \vee Q) \wedge (d \vee (B\bot \vee d\bot)) \Leftrightarrow ((B \wedge d\bot) \wedge (\top P \vee Q))$$

$$\Leftrightarrow ((B \wedge B\bot) \wedge d \vee (B\bot \vee d\bot)) \Leftrightarrow ((\top P \wedge \top Q) \vee d)$$

$$\Leftrightarrow ((B \wedge d\bot) \wedge d \vee (B \vee d)\bot \Leftrightarrow \top (P \vee Q) \vee (\top P \vee Q))$$

(50) $B \wedge d\bot \Leftrightarrow [(B \wedge d\bot) \wedge d\bot \leftarrow (B \vee d)\bot] \Leftrightarrow \top P \vee Q$ (99)

$$\Leftrightarrow (Q \wedge 1) \Leftrightarrow (1 \vee B)$$

$$\Leftrightarrow (Q \wedge (Q \vee P)) \wedge e \Leftrightarrow ((d \vee B) \wedge B) \wedge e$$

$$\Leftrightarrow (Q \wedge (P \vee Q)) \wedge e \Leftrightarrow ((P \vee Q) \wedge (B \vee d)) \wedge 1$$

$$\Leftrightarrow ((P \vee Q) \wedge (1 \wedge Q)) \Leftrightarrow (1 \vee B) \wedge (B \vee d)$$

$$\Leftrightarrow (P \vee Q) \wedge (Q \wedge 1) \Leftrightarrow (B \vee d) \wedge (1 \vee B)$$

$$\Leftrightarrow (P \vee Q) \wedge 1 \wedge Q \Leftrightarrow (B \vee d) \wedge 1$$

$$\neg B\bot\bot \vee [e \vee (B \wedge d)\bot]\bot \Leftrightarrow \top [\top (P \vee Q) \wedge e]\bot$$

$$[B\bot \wedge [e \vee (B \wedge d]\bot]\bot \Leftrightarrow \top [\top (P \vee Q) \wedge e]\bot$$

(50) $(1 \vee B) \equiv (B\bot \wedge [e \vee (B \wedge d)]\bot]\bot$ (69)

7a)

steps	steps Used	Main step
1	—	$\neg p \to q$
2	—	$q \to \neg s$
3	1 & 2	$\neg p \to \neg s$
4	3	$\neg s \to p$
5	—	$p \to r$
6	4 & 5	$\neg s \to r$
7	6	$\neg r \to s$

(05)

b)

$P(x): x \geq 0$

$q(x) = x^2 \geq 0$

$r(x) = x^2 - 3x - 4 = 0$

$s(x) = x^2 - 3 > 0$

In $\forall x$ $P(x) \to q(x)$ only false when the $P(x)$ is true and $q(x)$ is false.

$\forall x$ $P(x) \to q(x)$ is true

$\forall x$ $q(x) \to s(x)$ is false.

$\forall x$, $r(x) \vee s(x)$ is false at the condition $x = 1$

$\therefore \forall x$, $r(x) \vee s(x)$ is false.

$\therefore \exists x$ $P(x) \wedge r(x)$ is true.

$\therefore \forall x$ $r(x) \to p(x)$ is true

(05)

8a)

step	steps used	Main step
1	—	$\forall x [P(x) \vee Q(x)]$
2	1	$P(a) \vee Q(a)$
3	2	$\neg P(a) \rightarrow Q(a)$
4	3	$\neg P(a)$
5	3 and 4	$Q(a)$
7	—	$\neg Q(a) \vee R(a)$
9	7	$Q(a) \rightarrow \neg R(a)$
10	9	$S(a) \rightarrow R(a)$
11	7 & 9	$\neg P(a) \rightarrow \neg R(a)$
12	10 & 11	$\neg S(a)$.

(05)

8b)

$P \uparrow (Q \uparrow R) \iff \neg P \vee (Q \wedge R)$

$Q \uparrow^{(a)} R$	$P \uparrow (a)$	$\neg P$	$Q \wedge R$ (b)	$\neg P \vee (b)$
T	T	T	F	T
T	T	T	F	T
T	T	T	F	T
F	T	T	T	T
T	T	F	F	F
T	F	F	F	F
T	F	F	F	F
F	F	F	F	F
	T	T		T

(05)

9a) (05)

p : $(l-m)$ is odd

q : $m-n$ is odd

r : $l-n$ is odd

$u = (p \wedge q) \rightarrow \neg r$

$v = \neg(p \wedge q) \vee \neg r$

$\neg u = \neg\neg(p \wedge q) \wedge \neg\neg r$

$= (p \wedge q) \wedge r$

$= \forall x\,(p(x) \wedge q(x)) \rightarrow \neg u(x)$

$\neg u = \exists x\, p(x) \wedge q(x) \vee r(x)$

9 b) (05)

p : n is an odd integer

q : n^2 is odd

Let us assume that p is true

$p = 2k+1$

$q = n^2$

$= (2k+1)^2$

$= 4k^2 + 4k + 1$

$= 2(2k^2+2k)+1$ $\quad m = 2k^2+2k$

$= 2m+1$

$\therefore q$ is adso odd

$\therefore p \rightarrow q$ from direct proof.

10a) p : Home team wins. (05)

q : it is raining

Inverse : $(\neg p \rightarrow \neg q)$

"If home team not wins then it is not raining.

Converse : $q \rightarrow \neg p$

If it is raining then home team wins.

Contra positive :

$\neg q \rightarrow \neg \neg q$

If it is not raining then home team not wins.

b) 1) $p \rightarrow \neg q$ (02)

If swimming in the new jersy seashore is allowed then sharks have been not near the sea

2) $\neg p \rightarrow \neg q$ (02)

If swiming in the new jersy seashore is not allowed then shore have been not near the Sea shore.

3) $p \leftrightarrow q$ (01)

swiming in the new jersy seashore is allowed if and only if sharks have been near the Sea shore.

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Academic years 2018-19,2019-20 and 2020-21

ESTD : 2001

1	R	N							

DEPARTMENT OF MECHANICAL ENGINEERING

Semester: 7th SEM CV/CSE/ISE/EE | **2nd INTERNAL TEST** | **DATE: 22-12-2021**
Time: 9.00 am to 10.40 am | **Sub: Energy and Environment** | **Max. Marks: 50**

Sub Code: 18ME751

Note: Use of Compound Interest Table is permitted.

Q. No		Question	M	BCL	CO's
1.	a.	Distinguish between 'preliminary energy audit' and 'detailed energy audit'?	5	L2	CO2
	b.	What are the objectives of energy management?	5	L2	CO2
		OR			
2.	a.	Give a typical energy audit reporting format.	5	L2	CO2
	b	What are the principles of energy management?	5	L2	CO2
3	a.	List & Explain the steps involved in 'detailed energy audit'. (EA)	5	L2	CO2
	b.	What are the general characteristics of capital investment	5	L2	CO2
		OR			
4		Calculate the cost of generation per kWh for a power station having the following data: Installed capacity of the plant = 200 MW Capital cost = Rs 400 crores Rate of interest and depreciation = 12% Annual cost of fuel, salaries and taxation = Rs 5 crores Load factor = 40% Also estimate the saving in cost per kWh if the annual load factor is raised to 60%.	10	L3	CO2
5.		Company owns a premium plot. They have to decide which of the several alternatives to select in trying to obtain a desirable return on his investment. After much study and calculation, they decide that the two best alternatives are as given in the following table: Evaluate the alternatives based on future worth method at i=15%	10	L3	CO2
		OR			
6.		There are two alternatives for purchasing a concrete mixer. Both the alternatives have same useful life. The cash flow details of alternatives are as follows; **Alternative-1**: Initial purchase cost = Rs.3,00,000, Annual operating and maintenance cost = Rs.20,000, Expected salvage value = Rs.1,25,000, Useful life = 5 years. **Alternative-2**: Initial purchase cost = Rs.2,00,000, Annual operating and maintenance cost = Rs.35,000, Expected salvage value = Rs.70,000, Useful life = 5 years. Using present worth method, find out which alternative should be selected, if the rate of interest is 10% per year.	10	L3	CO2

	Build Solar power plant	Build Hydro power plant
First cost (Rs.)	20,00,000	36,00,000
Annual property taxes (Rs.)	80,000	1,50,000
Annual income (Rs)	8.00,000	9,80,000
Life of land(years)	20	20

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ESTD : 2001

7	a.	Define Environment. Mention its scope	5	L2	CO3
	b.	What are the classifications of biotic and Abiotic components? Explain in brief.	5	L2	CO3
		OR			
8.	a.	Discuss the Environment related need for public awareness	5	L2	CO3
	b.	Bring out the difference between oxygen and nitrogen cycle	5	L2	CO3
9.	a.	List the types of ecosystem?	2	L2	CO3
	b.	What is an ecosystem? Discuss forest ecosystem. Explain how conservation of forest can be done.	8	L2	CO3
		OR			
10		Write a short note on (i) ecological succession (ii) food chain iii) food web iv) ecological pyramid.	10	L2	CO3

Blooms Cognitive Level: ***L1Remember, L2 Understand, L3Apply, L4Analyze, L5Evaluate, L6Create***

Q.No	18ME751: Energy and Environment Quiz-2	Marks	BCL	CO's
1.	All the environment crisis are solely due to_____rise a) Population b) Water quality c) Air quality d) None of the above	1	L2	CO2
2.	"The judicious and effective use of energy to maximize profits and enhancecompetitive positions". This can be the definition of: a) Energy conservation b) Energy management c) Energy policy d) Energy Audit	1	L2	CO2
3.	The liquid water component of earth is called ---------- --. a) Lithosphere b) Hemisphere c) Hydrosphere d) Atmosphere.	1	L2	CO2
4.	The objective of energy management includes a) Minimizing energy costs b) minimizing waste c) Minimizing environmental degradation d) all the above	1	L2	CO2
5.	A system without life a) Abiotic b) Biotic c) Stainable d) Organic	1	L2	CO3
6.	WHO stands for? a) World Hygiene Observation b) World Health Organization c) Wild Hazardous Organisms d) None the above	1	L2	CO3
7.	Energy manger should be well versed with a) Manufacturing and processing skills b) Technical and marketing skills c) Managerial and technical skills d) Managerial and commercial skills	1	L2	CO3
8.	Deforestation increases % of ----------in atmosphere. a) Oxygen b) Hydrogen c) Nitrogen d) Carbon di oxide.	1	L2	CO3
9.	A flesh eating animal a) Carnivore b) Herbivore c) Coalition d) Carboxylation	1	L2	CO3
10	An energy policy does not include a) Target energy consumption reduction b) Declaration of top management commitment c) Time period for reduction d) Future production projection	1	L2	CO3

********GOOD LUCK*******

R.N.S. INSTITUTE OF TECHNOLOGY

Channasandra, Uttarahalli Main Road, Bangalore 560 098

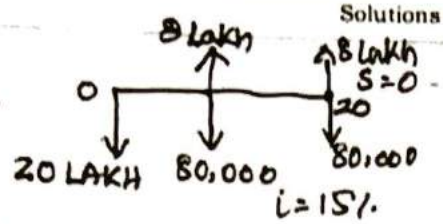
Date of IA Test : 22/12/21	SUB: Energy & Environment	Timings : 9 - 10.40 AM
Day : Wednesday.	SUB CODE:	Time Duration : 1.40
Branch : Mechanical Engineering	IA Test – II	Max Marks : 50
Semester : VII (OE)	Test Solutions / Scheme of Evaluation	Staff Incharge : TKC / AK
Section : CS - A		Staff Sign:

Q.No.	Solutions with steps in brief	Marks Allocation
1 a)	$2\frac{1}{2}$ Marks x 02 = 5 Marks	
b)	Sys. improvement, Energy saving, optimisation & operation upgradation – 05 Marks	
2 a)	ACK, Content, Summary, Summary of Savings, Introduction, Plant Energy System, Energy usage Energy Indicators, Energy Savings, Recommendations, follow up, Results. – 05 Marks	
b)	History, Energy Audits, Housekeeping, Analysis & Energy use, Equipment, Process, losses, Recovery, Alternate Energy Sources, Energy Efficiency, Reuse, Recycle, Evaluation – 05 Marks	
3 a)	10 Steps :- 1) Plan & organise 3) Data gathering 2) Meetings 4) Survey 5) Trails/Expt 6) Analysis 7) Identification 8) Cost benefit Analysis 9) Report & presentation 10) Implementation & Follow up – 05 Marks	
b)	Initial Cost Annual Expenses & Revenues Periodic replacement & Maintenance Salvage value – 05 Marks	
4)	$0.4 = \frac{\text{Avg Load}}{200}$ Avg Load = 80 MW $E = 80 \times 10^3 \times 8760$ $= 700.8 \times 10^7$ – 03 M $0.6 = \frac{\text{Avg L}}{200}$ Avg L = 120 MW. $E = 120 \times 10^3 \times 8760$ $= 105.12 \times 10^7$ – 03 M Int + Dep = $0.12 \times 400 \times 10^7 = 48 \times 10^7$ Total Cost = $48 \times 10^7 + 5 \times 10^7 = 53 \times 10^7$ Cost = $\frac{53 \times 10^7}{700.8 \times 10^7} = 0.756$ – 01 M Cost = $\frac{53 \times 10^7}{105.12 \times 10^7} = 0.5$ – 01 M Saving = 1.21 - 0.5 = Rs 0.71 – 02 M	

Q.No. | Solutions with steps | Marks Allocation

5.

P1



$i = 15\%$.

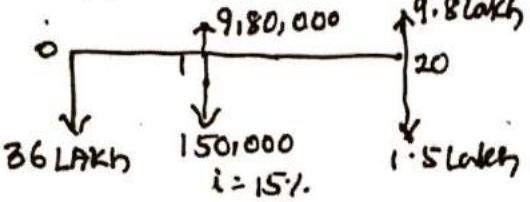
$FWA = -20,00000\left(\frac{F}{P},15,20\right) - 80,000\left(\frac{F}{A},15,20\right) + 8,00,000\left(\frac{F}{A},15,20\right)$

$= -20,00000 \times 16.367 - 80,000 \times 102.44 + 8,00,000 \times 102.44$

$= -32,734,000 - 8,195,200 + 81,952,000$

$= 41,022,800$ — 04M

P2:



$i = 15\%$.

$FWA = -36,00,000\left(\frac{F}{P},15,20\right) - 1,50,000\left(\frac{F}{A},15,20\right) + 9,80,000\left(\frac{F}{A},15,20\right)$

$= -36,00,000 \times 16.367 - 1,50,000 \times 102.44 + 9,80,000 \times 102.44$

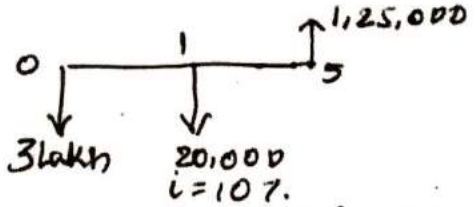
$= -58,921,200 - 15,366,000 + 100391200$

$= 26,104,100$ — 04M

P1 is Better : Build Solar PP. — 02M

6.

P1:



$i = 10\%$.

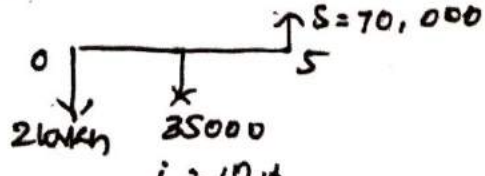
$PWA = -3,00,000\left(\frac{P}{F},10,5\right) - 20,000\left(\frac{P}{A},10,5\right) + 1,25,000\left(\frac{P}{F},10,5\right)$

$= -3,00,000 - 20,000 \times 3.791 + 1,25,000 \times 0.6209$

$= -3,00,000 - 75,820 + 77612.5$

$= -298,207.5$ — 02M

P2



$i = 10\%$.

PWA: $-2,00,000\left(\frac{P}{P},10,5\right) - 35,000\left(\frac{P}{A},10,5\right) + 70,000\left(\frac{P}{F},10,5\right)$

$= -2,00,000 - 35000 \times 6.791 + 70,000 \times 0.6209$

$= -2,00,000 - 1,32,682 + 43,463$

$= -2,89,219$ — 04M

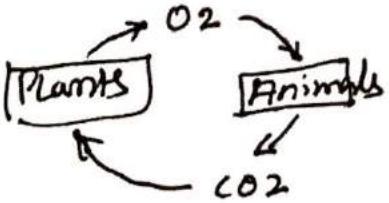
P2: is Better — 02M

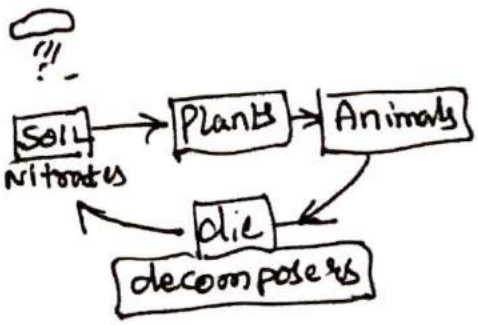
7 a) Natural Resources Conservation & Management
Ecology & Bio diversity
Pollution Control
Human population & Env.
Social issues — 05M
R & D, Green Advocacy, Green Marketing,
Green media, Env. Consultancy

b) Biotic : Living things – Animals
Abiotic : Non living things – Atmosphere, Soil, Water — 05M

8 a) Growing population
Poverty.
Env. degradation
Agriculture
Ground water
Development & Forests
Degradation of land
Urbanization
Pollution — 05M

b) O2 cycle · N2 cycle — $2\frac{1}{2} \times 2 = 5$ Marks





9 a) Forest, Desert, Grassland, Aquatic — 02M

b) Eco system is balancing of natural things with living & non living things.

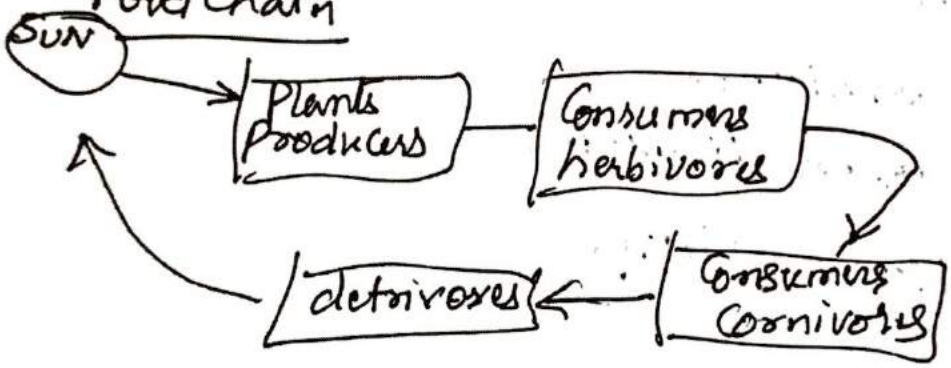
Forest
- Coniferous
- Broad lived
  - Evergreen
  - Deciduous
  - Thorn
  - Mangrove.

10

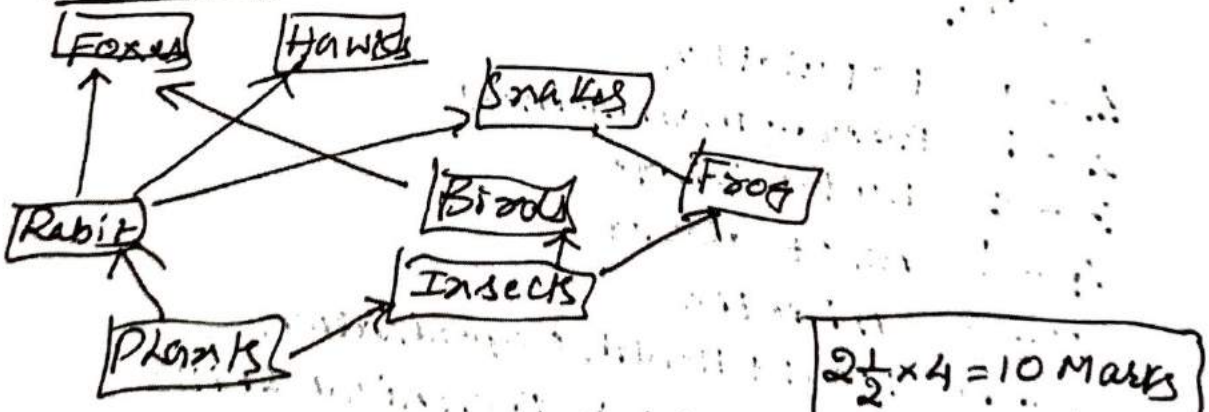
— 08M

a) Ecological Succession:- Evolution of Ecosystem over period of time.

Food chain

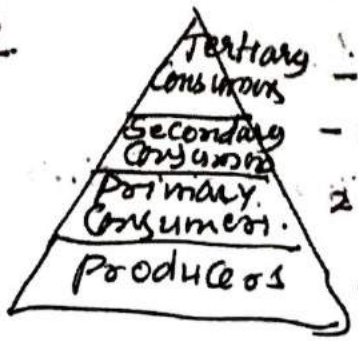


Food web



$2\frac{1}{2} \times 4 = 10$ Marks

Pyramids



- 1 Eagle.
- 8 Frogs.
- 29 Grasshoppers
- 1500 Grass

Quiz

1 - a Population
2 - b Energy management
3 - c Hydrosphere
4 - d All of above
5 - a Abiotic
6 - b World Health organization
7 - c Managerial & Technical Skills
8 - d Carbon di oxide
9 - a Carnivore
10 - d Future production projection

Sixth Semester B.E. Degree Examination, July/August 2022
Data Mining and Data Warehousing

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. With a neat diagram, explain a Three – Tier Data Warehouse. **(10 Marks)**

b. List and explain Data Warehouse Models. **(10 Marks)**

OR

2 a. With suitable example, explain Star schema , Snow Flake schema , Fact Constellation schema for Multidimensional database. **(10 Marks)**

b. Explain OLAP Operations with example. **(10 Marks)**

Module-2

3 a. Explain OLAP Data indexing for Bitmap Index and Join index. **(10 Marks)**

b. Differentiate ROLAP , MOLAP and HOLAP Servers. **(10 Marks)**

OR

4 a. Explain Data – preprocessing steps and the challenges faced in Data Mining. **(10 Marks)**

b. Briefly explain Similarity and Dissimilarity between the objects. Find the SMC and Jacquard coefficient of Two binary vectors.

$X = (1, 0, 0, 0, 0, 0, 0, 0, 0, 0)$ $Y = (0, 0, 0, 0, 0, 0, 0, 0, 0, 1)$. **(10 Marks)**

Module-3

5 a. Explain the rule generation in Apriori Algorithm with example. **(10 Marks)**

b. Explain the Alternative method for generating frequent itemset. **(10 Marks)**

OR

6 a. Briefly explain FP growth algorithm. **(10 Marks)**

b. Explain the objective measure of Interestingness for evaluating association patterns. **(10 Marks)**

Module-4

7 a. With a neat block diagram, explain general approach to solve classification problems with application. **(10 Marks)**

b. Explain with example, how to build decision tree using Hunt's algorithm. **(10 Marks)**

OR

8 a. Explain different method for comparing classifier. **(10 Marks)**

b. Explain the rule based classifier with example. **(10 Marks)**

Module-5

9 a. Describe K – means clustering algorithm. What are its limitations? **(10 Marks)**

b. With example, explain Agglomerative Hierarchical clustering with example. **(10 Marks)**

OR

10 a. With Time and Space complexity, explain DBSCAN Clustering Algorithm. **(10 Marks)**

b. Explain the BRICH Scalable Algorithm. **(10 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV833

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Pavement Design

Time: 3 hrs. Max. Marks: 80

Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Briefly explain the Pavement Components and functions of components. **(04 Marks)**
b. Write comparison between Flexible and Rigid Pavement. **(04 Marks)**
c. Explain briefly Design factors to be considered in the design of pavement. **(08 Marks)**

2 a. List and briefly explain the assumptions and limitations of Bousinerq's theory. **(08 Marks)**
b. Design the thickness of a flexible pavement by Bunmister's two layer analysis for a wheel load of 40 kW and a tyre pressure of 0.5 MN/m^2. The modulus of elasticity of the pavement materials is 150 MN/m^2 and that of the subgrade is 30 MN/m^2. **(08 Marks)**

a = 16cm
D = 0.17cm
Burmister Deflection chart

Module-2

3 a. With a sketch describe the significance of design wheel load and contact pressure in design of pavement. **(04 Marks)**
b. Explain the concept of Equivalent Single Wheel Load (ESWL). **(04 Marks)**
c. Calculate the design repetition for 20 years period for wheel load equivalent to 2268 kg wheel load using the following traffic survey data on a four lane road.

Wheel load (kg)	Average daily traffic ADT in both directions	% of total traffic volume
2268	Total volume 215 Considering traffic growth	13.17
2722		15.30
3175		11.76
3629		14.11
4082		6.21
4532		5.84

1932363

Dia of wheel = 35.68cm McLeod chart **(08 Marks)**

4 a. Design a highway pavement using McLeod method of wheel load 6000 kg with tyre pressure of 6 kg/cm^2. The plate load test conducted on subgrade soil using 30 cm dia plate yield a pressure 2.8 kg/cm^2 after 10 load repetitions at 0.5 cm deflection. **(08 Marks)**
b. In a dual wheel assembly the load on each wheel is 32 kN tyre pressure is 0.6 N/mm^2 and c/c wheel spacing 410 mm. The load is placed on a pavement 500 mm thick. The subgrade characterized by E = 20 N/mm^2 and μ = 0.5. Calculate the deflection on the top of subgrade at the radial distance of 0.15 and 250 from the centre of left wheel measured towards other wheel using deflection chart. **(08 Marks)**

r = 50.63cm
a = 30.29cm
D = 2.57
r = 500
r/a = 3.83

Module-3

5 a. Explain typical failures of flexible pavement. **(08 Marks)**
b. Briefly explain the various maintenance works of bituminous surfaces. **(08 Marks)**

6 Write notes on:

a. Roughness measurement **(04 Marks)**

b. Falling Weight Deflectometer **(04 Marks)**

c. Benkelman beam deflection method **(08 Marks)**

Module-4

7 a. Explain:

(i) Radius of relative stiffness

(ii) Equivalent radius of resisting section

(iii) Critical load position **(08 Marks)**

L = 79.50
l = 14.50 cm

b. A cement concrete pavement of 25 cm thickness is constructed over a granular surface having modulus of reaction 10 kg/cm^3. The maximum temperature different between the top and bottom of the slab during winter is found to be 15°C. The spacing between the transverse joint is 7.5 m. Find the worst combination of stresses at the edge and corner regions. **(08 Marks)**

8 a. Write the step by step procedure for the design of concrete pavement as recommended by IRC 52.2002. IRC 58 **(08 Marks)**

b. Design the size and spacing of dowel bar at the expansion joints of a cement concrete pavement of thickness 25 cm with radius of relative stiffness 80 cm. For a design wheel load of 5000 kg. Assume load capacity of the dowel system as 40% of the design wheel load joint width is 2 cm, permissible shear and flexural stress in the dowel bar are 1000 and 1400 kg/cm^2 and permissible bearing stresses in cement concrete is 100 kg/cm^2 diameter of dowel bar = 2.5 cm. **(08 Marks)**

Module-5

9 a. Explain the failures in Rigid Pavement. **(08 Marks)**

b. Explain different methods of pavement evaluation. **(08 Marks)**

10 a. List the types of joints and explain briefly. **(08 Marks)**

b. List and explain the desirable properties of subgrade. **(08 Marks)**

* * * * *

ℓ_b = i = L_d = 45 cm

ii = P' = 4906.62 kg

spacing of dowel bar = 144 cm

check = 2.95 > 2.65 ✓

15CV833

Visvesvaraya Technological Universi
Belagavi, Karnataka - 590 018

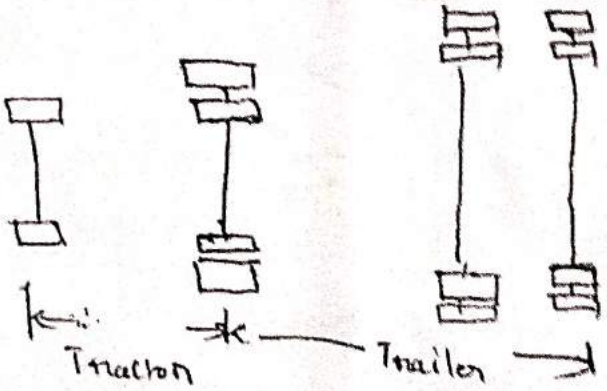
6/11/19
Signature of Scrutinizer

Scheme & Solution

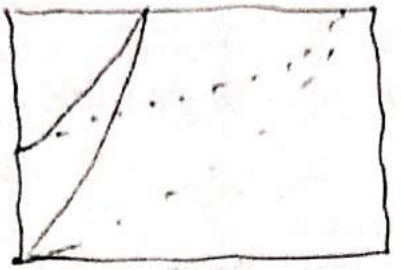
Subject Title : Pavement Design Subject Code : 15CV833

Question Number	Solution	Marks Allocated
1 a.	Pavement Components i) Subgrade ii) Sub base course, iii) Base course & its functions	04
b.	& Comparison b/n flexible & rigid Pavement	04
c.	Design factors Designlife, Reliability, Traffic factors & Road Geometry	08
2 a.	Assumptions : All five Assumptions & Equations Horizontal stress $\sigma_x = \sigma_y = \frac{P}{2}\left[(1+2\mu) - \frac{2(1+\mu)z}{(a^2+z^2)^{1/2}} + \frac{z^3}{(a^2+z^2)^{3/2}}\right]$ Vertical stress $\sigma_z = P\left[1 - \frac{z^3}{(a^2+z^2)^{3/2}}\right]$ Explanation :	03 05 08

Subject Title : Pavement Design Subject Code : 15CV833

Question Number	Solution	Marks Allocated
2 b.	Load = P = 40 kN Tyre Pressure = 0.5 MN/m² $E_1 = 150$ MN/m² = E_p $E_2 = 30$ MN/m² = E_s Flexible Pavement $\Delta = \frac{1.5 P a}{E_2} \times F_w$ Tyre Pressure = $\frac{\text{Wheel load}}{\text{area}}$ $\therefore$ $a = 16$ cm. $\Delta = 0.17$ cm.	04 04 08
3 a.	 $\sigma_z = P \left\{ 1 - \frac{z^3}{(a^2+z^2)^{3/2}} \right\}$ where σ_z = Vertical stress at depth z P = Surface Pressure a = radius of loaded area z = depth at which σ_z is computed	04

Subject Title : Pavement Design Subject Code : 15CV833

Question Number	Solution	Marks Allocated
	Contact Pressure 	
3 b	Explanation of ESWL. with sketch	04
3 c.	Design of repetition of 2268 kg wheel load/lane $= \frac{7729452}{4} = 1932363.$	08
4 a.	(i) Dia of wheel = 35.68 cm.	04
	(ii) $T = k \log_{10}\{P/s\} = 50.63$ cm.	04
		08
4 b	$E = 20\ N/mm^2$ Wheel load = 32 kN. Tyre Pressure $= 0.6\ N/mm^2$ $a = 130.24$ mm $z = 500$ $\frac{z}{a} = 3.83$ $\Delta = 2.87$mm	04 04 08.

Subject Code : 15CV833

Subject Title : Pavement Design

Question Number	Solution	Marks Allocated
5 (a)	(1) Alligator crack (2) depression in Pavement (3) shear failure & cracking (4) Longitudinal Cracking (5) Frost heaving with sketches	08
5 (b)	Patch repairs, Preventing skidding of vehicles Reduces reflection Cracking, stripping & travelling, waves & corrugations, etc With Explanations	08
6	with standard Values Explain all three Equipments 4 +4 8 16	16
7 (a)	(i) Radius of relative stiffness $$l = \left[\frac{Eh^3}{12k(1-\mu^2)}\right]^{1/4}$$	02
	(ii) Equivalent radius of resisting section $$b = \sqrt{1.6a^2 + h^2} - 0.675h$$ when $a < 1.724h$ $a > 1.724h$ the value of $b = a$	03
	(iii) (a) Interior loading (b) Edge — " (c) Corner — "	03 08

Subject Title : Pavement Design Subject Code : 15CV833

Question Number	Solution	Marks Allocated
7 (b)	Radius of relative stiffness $\ell = 79.50$ cm — (4) $f = 14.504$ cm — (04)	08
8 a.	Procedure for the design of Concrete Pavement	08
b.	(i) Length of dowel bar $L_d = 5d \left[\frac{F_t}{F_b} \times \frac{L_d + 1.5\delta}{L_d + 8.88} \right]^{y_2}$ Provide $L_d = 45$ cm.	02
	(ii) Load transfer capacity of single dowel bar $P' = 4906.62$ kg Spacing of dowel bar = 144 cm.	02
	Check 2.92 > 2.65 As this value is greater than required Capacity factor 2.65 the spacing of dowel bar is adequate.	04 08
9 (a)	failures in Rigid Pavement (i) scaling of cement Concrete (ii) Shrinkage cracks (iii) Spalling of joints (iv) warping cracks (v) mud pumping (vi) Structural cracks & brief explanation	08
(b)	Explanation of Pavement Evaluation	08
10 (a)	Types of joints. (i) Expansion joint (ii) Contraction joints (iii) warping joints (iv) Construction joints (v) Longitudinal joints Explanation with relevant sketches	08

10 (b) Desirable Properties of Subgrade

(i) Incompressibility (ii) Good Drainage

(iii) Less volumetric changes etc

(iv) Stability

Brief Explanation of above factors

08

End.

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15EC61

Sixth Semester B.E. Degree Examination, Feb./Mar. 2022
Digital Communication

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing ONE full question from each module.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. What is Hilbert transform? Explain the properties of Hilbert transform. **(08 Marks)**

b. Explain complex envelops of bandpass signals. **(08 Marks)**

OR

2 a. Given the binary sequence 10011011. Draw the following line codes.
i) Unipolar NRZ and unipolar RZ
ii) Polar NRZ and polar RZ
iii) Bipolar NRZ and bipolar RZ
iv) Manchester format. **(07 Marks)**

b. Write a short note on BNZS. **(05 Marks)**

c. What is pre envelop? Explain. **(04 Marks)**

Module-2

3 a. Explain the geometric representation of signals. **(08 Marks)**

b. Explain the Gram-Schmidt orthogonalisation procedure. **(08 Marks)**

OR

4 a. Three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ are as shown below. Apply Gram-Schmidt procedure to obtain an orthonormal basis for the signal. Express the signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ in terms of orthonormal basis function.

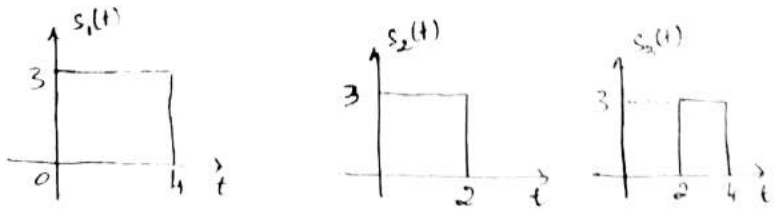


Fig.Q4(a) **(06 Marks)**

b. What is a matched filter? Explain its properties. **(06 Marks)**

c. Explain correlation receiver in brief. **(04 Marks)**

Module-3

5 a. Explain BPSK system with the help of transmitter and receiver. **(08 Marks)**

b. Draw the block diagram of DPSK transmitter and explain for the binary sequence 1100100011O, find the resulting waveform for DPSK system. **(08 Marks)**

OR

6 a. Obtain an expression for probability of symbol error for coherent binary FSK. **(07 Marks)**

b. Compare MSK and QPSK. What is the bandwidth requirement of MSK? **(05 Marks)**

c. An FSK system transmits binary data a the rate of 2×10^6 bits per second. During the course of transmission, AWGN of zero mean and two sided power spectral density 10^{-20} watts per hertz is added to the signal. The amplitude of the received sinusoidal wave for digit 0 or 1 is 1 microvolt. Find the average probability of symbol error assuming non-coherent detection. **(04 Marks)**

Module-4

7 a. What is Inter Symbol Interference (ISI)? How it arises? **(06 Marks)**

b. Explain the need for a pre coder in a duo binary signaling. For input binary data 1011101, obtain the o/p of pre coder and output of duo binary coder. **(06 Marks)**

c. Explain modified duo binary encoding with pre coder. **(04 Marks)**

OR

8 a. Explain the block diagram of zero forcing equalizer. **(08 Marks)**

b. Explain adaptive equalizer. **(08 Marks)**

Module-5

9 a. What is PN – sequence? Explain the properties of PN – sequence. **(08 Marks)**

b. With the help of block diagram, explain direct sequence spread spectrum system. **(08 Marks)**

OR

10 a. A spread spectrum communication system has the following parameters :
Information bit duration = T_s = 4 millisecs
PN chip duration = T_c = 2 micro secs. Find the bit rate of the binary data, PN – sequence length, band width of the PN sequence and processing gain of the system. **(04 Marks)**

b. Explain with neat block diagram, the working of frequency hop spread spectrum transmitter and receiver system. **(08 Marks)**

c. List the applications of spread spectrum modulation. **(04 Marks)**

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18EC61

Sixth Semester B.E. Degree Examination, Feb./Mar. 2022
Digital Communication

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Error function table is permitted.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define Hilbert Transform. List the properties of the Hilbert Transform. **(04 Marks)**

b. Obtain the canonical representation of Bandpass signals. **(06 Marks)**

c. What is line coding? For the binary stream {011010}, sketch the following line codes:
(i) Unipolar NRZ (ii) Polar NRZ
(iii) Bipolar NRZ (iv) Manchester **(10 Marks)**

OR

2 a. Define Pre-envelope of a real valued signal. Given a Bandpass signal, g(t), sketch the amplitude spectra of the signal, g(t), pre-envelop $g_+(t)$ and complex envelope $\tilde{g}(t)$. **(08 Marks)**

b. For the AM signal, $s(t) = m(t)\cos(2\pi f_c t + \phi)$. Find the following :
(i) Pre-envelope (ii) Complex envelope (iii) In-phase and Quadrature components
(iv) Natural Envelope. **(08 Marks)**

c. Write a note on HDBN Signalling. **(04 Marks)**

Module-2

3 a. Explain the geometric representation of set of M-energy signals as linear combination of N-orthonormal basis functions. Illustrate for the case N = 2 and M = 3 with necessary diagrams and expressions. **(10 Marks)**

b. Explain the matched filter receiver. Obtain the expression for the impulse response of the matched filter. **(10 Marks)**

OR

4 a. Explain the Gram Schmitt orthogonalization procedure. **(10 Marks)**

b. Three signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ are as shown in Fig.Q4(b). Apply GSOP to obtain an orthonormal basis function. Also give the signal constellation diagram.

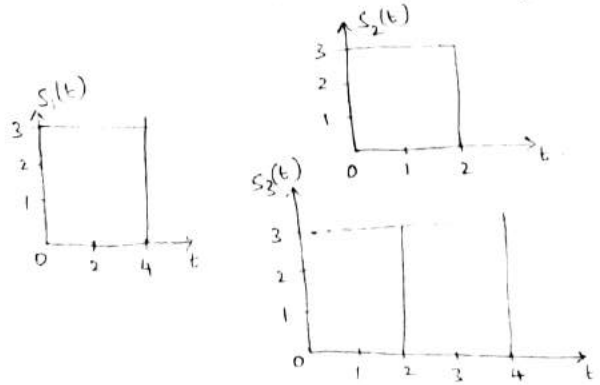


Fig.Q4(b) **(10 Marks)**

Module-3

5 a. With a neat block diagram, explain the generation and detection of BPSK technique. **(10 Marks)**

b. An FSK transmits binary data at the rate of 2.5×10^6 bps. During the course of transmission, AWGN of zero mean and PSD of 10^{-10} Watts/hz is added to the signal. In the absence of noise, amplitude of the received signal for digit 1 or 0 is 1 mV. Determine the average probability of symbol error for the following :
(i) BFSK using coherent detection
(ii) BFSK using non-coherent detection. **(10 Marks)**

OR

6 a. Describe QPSK signal with its signal space diagram? With the help of a block diagram, explain the QPSK generation and detection technique. **(10 Marks)**

b. Binary sequence, d_i {0010011001} is applied to the DPSK transmitter. Obtain differentially encoded sequence, DPSK waveform and in the absence of noise, reconstruct the original binary sequence. Also write the phase shift in the carrier signal for the differentially encoded sequence. **(10 Marks)**

Module-4

7 a. With a neat block diagram of a digital PAM system. Obtain the expression for ISI. **(06 Marks)**

b. State and prove Nyquist condition for zero ISI? **(06 Marks)**

c. For the binary data sequence $[d_K]$ given by {11101001000}. Determine the precoded sequence, transmitted sequence, received sequence and the decoded sequence. **(08 Marks)**

OR

8 a. What is zero forcing equalizer? With a neat block diagram, explain the operation of Linear Transversal filter. **(10 Marks)**

b. For a four level T_x with Duobinary pulses for the given data sequence, d_n {0013120332010}. Determine the Precoded sequence, Transmitted sequence, Received sequence, Decoded sequence with initial bit as 'zero'? **(10 Marks)**

Module-5

9 a. Explain the model of a spread spectrum digital communication system. **(08 Marks)**

b. Design a 4-stage linear feedback shift register. If the initial state is 1111, find the output sequence of the shift register. Also calculate the periodic length, L and processing gain, PG. **(08 Marks)**

c. Define the following :
(i) Processing gain (ii) Jamming margin **(04 Marks)**

OR

10 a. Explain the generation and demodulation of DSSS signals with necessary equations and block diagram. **(08 Marks)**

b. In a DSSS modulation, it is required to have a Jamming Margin = 26 dB. The ratio E_b / N_b is set at 10. Determine the minimum processing gain and the minimum number of stages required to generate the maximum length sequence. **(04 Marks)**

c. What are the advantages and disadvantages of spread spectrum modulation technique? **(08 Marks)**

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17EC61

Sixth Semester B.E. Degree Examination, Jan./Feb. 2021
Digital Communication

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. State and explain the Hilbert transform and its orthogonal property. **(10 Marks)**

b. Derive the canonical representation of bandpass signal. **(10 Marks)**

OR

2 a. Derive the expression for the complex lowpass representation of band pass system. **(10 Marks)**

b. Define line coding, for the given binary data sequence "10011011" draw the following line codes:
(i) Unipolar NRZ (ii) Unipolar RZ (iii) Polar NRZ
(iv) Bipolar NRZ (v) Manchester format **(10 Marks)**

Module-2

3 a. Explain the geometric representation of signals and also show that energy of the signal is equal to the squared length of the vector representing it. **(10 Marks)**

b. Two functions S1(t) and S2(t) as shown in Fig.Q3(b), the interval in $0 \le A \le T$ secs. Using Grand Schmitt orthogonalization procedure express these functions interms of orthonormal basis function, also sketch orthonormal basis function.

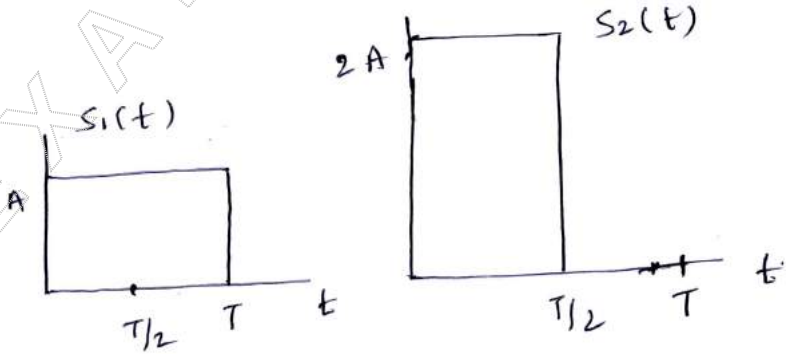


Fig.Q3(b) **(10 Marks)**

OR

4 a. Derive the statistical characterization of correlator outputs. **(10 Marks)**

b. Describe the matched filter receiver and obtain the impulse response of matched filter. **(10 Marks)**

Module-3

5 a. Illustrate the DPSK transmitter and receiver for the given binary sequence 10010011, obtain the differentially encoded sequence and its transmitted phase. **(10 Marks)**

b. Derive the expression for the probability of error for a binary PSK (Phase Shift Keying) using coherent detection. **(10 Marks)**

OR

6 a. Explain QPSK transmitter and receiver with neat block diagram. **(10 Marks)**

b. Derive an expression probability of error for binary FSK (Frequency Shift Keying) using coherent detection. **(10 Marks)**

Module-4

7 a. Discuss the digital PAM transmission through band limited baseband channel with neat diagram and obtain the expression for ISI. **(10 Marks)**

b. Illustrate the concept of adaptive equalization with neat diagram and relevant expressions. **(10 Marks)**

OR

8 a. Describe the design of band limited signals with controlled ISI. **(10 Marks)**

b. For the given binary data 10010110010, obtain the precoded sequence, transmitted sequence, received and decoded sequence for (i) Due-binary (ii) Modified due-binary. **(10 Marks)**

Module-5

9 a. Describe the model of spread spectrum digital communication system with neat diagram. **(08 Marks)**

b. Explain the generation and demodulation of Direct sequence spread spectrum with diagram and expression. **(08 Marks)**

c. A PN sequence is generated using linear feedback shift register with number of stages equal to 10. The chip rate is 10^7 per sec. find the following:

(i) PN sequence length

(ii) Chip duration of the PN sequence

(iii) Period the PN sequence **(04 Marks)**

OR

10 a. With a neat block diagram, explain the operation of frequency hop spread spectrum. **(10 Marks)**

b. Explain CDMA IS:95 forward link with neat block diagram. **(10 Marks)**

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15EC61

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Digital Communication

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define Hilbert transform. What are its applications. Prove that a signal g(t) and its Hilbert transform $\tilde{g}(t)$ are orthogonal over the entire time interval $(-\infty, \infty)$. **(05 Marks)**

b. Determine the pre-envelope and complex envelope of the RF pulse defined by $x(t) = A\,\text{rect}\left(\frac{t}{T}\right)\cos(2\pi f_c t)$. **(06 Marks)**

c. Compare the power spectra of various line codes in terms of bandwidth, DC component, Noise immunity and synchronization capability, with neat sketch. **(05 Marks)**

OR

2 a. Express bandpass signal s(t) in canonical form. Also explain the scheme for deriving the inphase and quadrature components of the bandpass signal s(t). **(06 Marks)**

b. Explain with relevant expressions, the procedure for computational analysis of a bandpass system driven by a bandpass signal. **(06 Marks)**

c. What is the advantage of HDB3 code over conventional alternate mark inversion(AMI) code. Code the pattern "1010000011000011000000" using HDB3 encoding and AMI encoding. **(04 Marks)**

Module-2

3 a. Explain the geometric representation of set of M energy signals as linear combination of N orthonormal basis functions. illustrate for the case N = 2 and M = 3, with necessary diagrams and expressions. **(08 Marks)**

b. Using the Gram-Schmidt orthogonalization procedure, find a set of orthonormal basic functions to represent the three signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ shown in Fig.Q3(b). also express each of these signals in terms of the set of basis functions. **(08 Marks)**

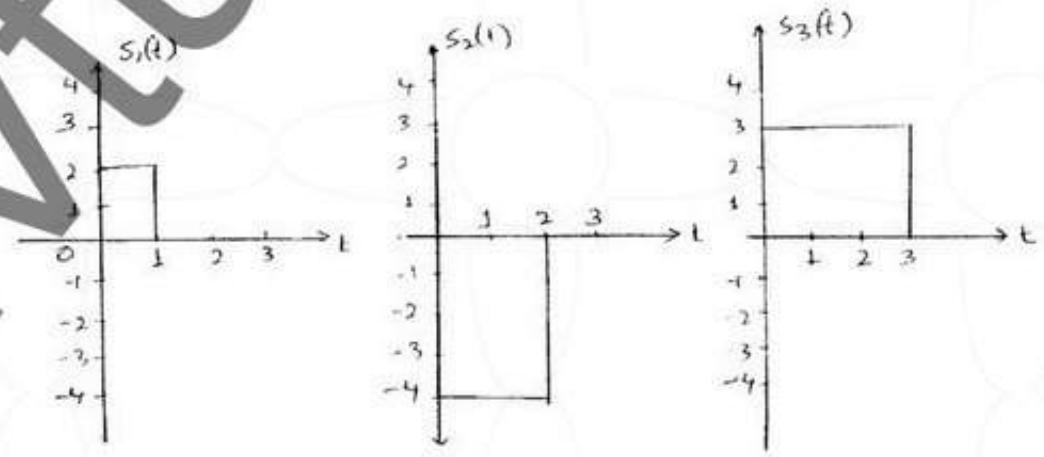


Fig.Q3(b)

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OR

4 a. Explain the correlation receiver with neat diagrams and explanation of detector and the maximum –linklihood decoder blocks. **(08 Marks)**

b. Explain the matched filter receiver. Obtain the expression for the impulse response of the matched filter. **(08 Marks)**

Module-3

5 a. Derive the expression for error probability of binary PSK using coherent detection. **(06 Marks)**

b. Binary data are transmitted over a microwave link at the rate of 10^6 bits/sec and the power spectral density of the noise at the receiver input is 10^{-10} ω/Hz. find the average carrier power required to maintain an average probability of error $Pe \leq 10^{-4}$ for the following cases.
Binary PSK using coherent detection
DPSK
Note : take $erfc(2.63) = 2 \times 10^{-4}$, $Q(3.7) = 10^{-4}$. **(06 Marks)**

c. Define bandwidth efficiency. Tabulate and comment on the bandwidth efficiency of M-ary PSK signals for different values of M. **(04 Marks)**

OR

6 a. With neat diagram and expressions, explain binary FSK generation and non-coherent detection scheme. **(06 Marks)**

b. Explain the generation and optimum detection of differential phase – shift keying with neat block diagram. **(06 Marks)**

c. What is the advantage of M-ary QAM over M-ary PSK system? Obtain the constellation of QAM for M = 4 and draw signal space diagram. **(04 Marks)**

Module-4

7 a. With a neat block diagram, explain the digital PAM transmission through band limited baseband channels. Also obtain the expression for inter symbol interference. **(06 Marks)**

b. Explain the modified duo-binary signaling scheme, with pre-coding. Illustrate the encoding for the binary sequence "011100101". Assume previous pre-coder outputs as 1. **(07 Marks)**
With neat diagram, explain the timing features pertaining to eye diagram and it interpretation for baseband binary data transmission system. **(03 Marks)**

OR

8 a. With neat sketches and expressions, explain raised cosine spectrum solution to reduce ISI. **(06 Marks)**

b. What is the advantage of controlled ISI partial response signaling scheme? With block diagram, explain the duo-binary encoder with pre-coder. Mention the frequency response, impulse response and its features. **(06 Marks)**

c. With neat diagram and relevant expressions, explain the concept of adaptive equalization. **(04 Marks)**

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Module-5

9 a. Explain the working of Direct Sequence Spread Spectrum transmitter and receiver with neat diagram, waveform and expressions. **(08 Marks)**

b. A slow frequency Hopped/MFSK system has the following parameters.
   i) The number of bits/MFSK symbol = 4
   ii) The number of MFSK symbols per hop = 5
   iii) Calculate the processing gain of the system in decibels. **(03 Marks)**

c. List and briefly explain any 3 applications of direct sequence spread spectrum. **(05 Marks)**

OR

10 a. With a neat block diagram, explain frequency Hopped spread spectrum technique. Explain the terms chip rate, Jamming Margin and processing gain. **(08 Marks)**

b. What is a PN sequence? Explain the generation of maximum-length sequences (ML-sequence). What are the properties of ML sequences? **(04 Marks)**

c. In a DS/BPSK system, the feedback shift register used to generate the PN sequence has length m = 19. The system is required to have an average probability of symbol error due to externally generated interfering signals that does not exceed 10^{-5}. Calculate the following system parameters in decibels :
   i) Processing gain
   ii) Antijam margin
   (Assume Q(4.25) = 10 –5 or erfc(3) = 2×10^{-5}). **(04 Marks)**

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17EE46

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Operational Amplifiers and Linear ICs

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Draw the block diagram of an op-amp and explain. **(10 Marks)**

b. Sketch the 3-input non-inverting summing amplifier circuit. Explain the operation of the circuit and derive an equation for the output voltage. Also explain how to convert it to an adder and averaging amplifier. **(10 Marks)**

OR

2 a. List the ideal characteristics of an op-amp (any six). **(06 Marks)**

b. Mention the advantages of using negative feedback in op-amps (any 4). **(04 Marks)**

c. What is an instrumentation amplifier? Obtain an expression for output voltage V_0, in terms of change in resistance ΔR of an instrumentation amplifier using transducer bridge. **(10 Marks)**

Module-2

3 a. With a neat circuit diagram, explain the working of 1st order low pass filter and draw its typical frequency response curve. **(10 Marks)**

b. Design a set adjustable positive voltage regulator using IC LM317 for the output voltage of 5 V. **(04 Marks)**

c. Mention the advantages of active filter over passive filters. (any six) **(06 Marks)**

OR

4 a. Draw the circuit of a adjustable voltage regulator and explain its operation. **(10 Marks)**

b. Design a second order low pass filter for a cut-off frequency of 1 kHz. Also draw the circuit diagram and mention the component values. **(06 Marks)**

c. Design a narrow band pass filter for the following specifications, centre frequency 1.5 kHz, Q-factor is 7, gain at f_C is 15. **(04 Marks)**

Module-3

5 a. With a neat circuit diagram, explain the working of triangular / rectangular wave generator. **(10 Marks)**

b. With a neat circuit diagram and waveform explain the working of inverting Zero Cross over Detector (ZCD). **(10 Marks)**

OR

6 a. With a neat circuit diagram and necessary derivation for load current, explain voltage to current converter with grounded load. **(10 Marks)**

b. Design a RC-phase shift oscillator using op-amp for a frequency of 500 Hz. Also draw the circuit diagram and name the component values take C = 0.1 μF **(06 Marks)**

c. Define the working principle of voltage to frequency (V/F) converter and mention its applications (any 4). **(04 Marks)**

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Module-4

7 a. With a neat circuit diagram and waveform explain the working of precision Full Wave rectifier. **(10 Marks)**

b. With a neat circuit diagram, explain the working of successive approximation type ADC. **(10 Marks)**

OR

8 a. Explain the operation of R-2R ladder digital to analog converter circuit. **(10 Marks)**

b. Design a non-saturating precision half wave rectifier to produce a 2 V peak output from a 1 MHz sine wave input with a 0.5 V peak value. Use Bi-polar op-amp with a supply voltage of ±15V. **(10 Marks)**

Module-5

9 a. With a neat block diagram, explain phase locked loop in detail. **(10 Marks)**

b. Draw the pin diagram of 555IC timer and mention its pin functions. **(05 Marks)**

c. Design a monostable multivibrator using IC 555 timer to obtain a pulse width of 10 msec. **(05 Marks)**

OR

10 a. With a neat diagram, explain the internal architecture of IC555 timer. **(10 Marks)**

b. Define the following terms related to PLL:

(i) Lock range.

(ii) Capture range.

(iii) Pull in time

(iv) Tracking range. **(08 Marks)**

c. Mention the applications of IC555 timer (any 4). **(02 Marks)**

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18EI81

Eighth Semester B.E. Degree Examination, July/August 2022
Neural Networks and Fuzzy Logic Systems

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. List the advantages and applications of neural networks. (08 Marks)
b. Briefly discuss the significance of genetic algorithm. (06 Marks)
c. Describe soft computing in problem solving process. (06 Marks)

OR

2 a. With the help of schematic diagram, explain the basic models of artificial neural network. (10 Marks)
b. Discuss the following terminology i) Weights ii) Bias iii) Threshold. (10 Marks)

Module-2

3 a. With a flowchart describe the Hebb training algorithm. (08 Marks)
b. For the network shown in figure calculate the net input to the output neuron.

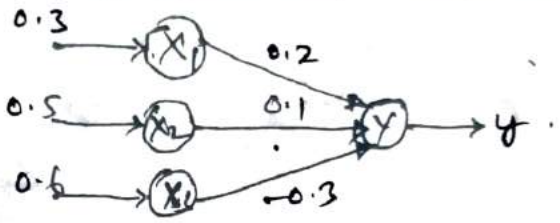


Fig.Q3(b) (04 Marks)
c. With a labeled block diagram, describe the original perception network. (08 Marks)

OR

4 a. Explain the architecture of adaptive linear neurons. (06 Marks)
b. With the help of neat flowchart, explain adaline training process. (08 Marks)
c. With the help of schematic diagram, describe multiple adaptive linear neurons. (06 Marks)

Module-3

5 a. With a labeled flowchart, explain the back-propagation network training process. (10 Marks)
b. Discuss the learning factors of back – propagation network. (10 Marks)

OR

6 a. Explain the radial basin function network. (06 Marks)
b. Describe the steps for RBF training algorithm. (08 Marks)
c. With the help of diagram, explain time delay neural network. (06 Marks)

Module-4

7 a. Explain the concept of fuzzy logic system. (04 Marks)
b. Describe the following operations on classical sets.
i) Union ii) Intersection iii) Complement iv) Difference. (10 Marks)
c. List the properties of fuzzy sets. (06 Marks)

OR

8 a. With the help of graphical representation, explain fuzzy relations. **(10 Marks)**

b. Explain the tolerance and equivalence relations of Fuzzy system. **(10 Marks)**

Module-5

9 a. Discuss the features of membership functions. **(08 Marks)**

b. Explain the following membership functions :
i) Inference ii) Angular fuzzy sets. **(12 Marks)**

OR

10 a. What is meant by defuzzification? Briefly discuss defuzzification methods. **(10 Marks)**

b. Describe the architecture and operation of FLC system. **(10 Marks)**

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18CS55

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Application Development using Python

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Demonstrate with example print( ), input( ) and string replication. **(06 Marks)**

b. Explain elif, for, while, break and continue statements in python with examples for each. **(10 Marks)**

c. Write a Python program to check whether a given number is even or odd. **(04 Marks)**

OR

2 a. How can we pass parameters in user defined functions? Explain with suitable example. **(05 Marks)**

b. Explain local and global scope with local and global variables. **(08 Marks)**

c. Demonstrate the concept of exception. Implement a code which prompts the user for Celsius temperature, convert the temperature to Fahrenheit, and print out the converted temperature by handling the exception. **(07 Marks)**

Module-2

3 a. What is list? Explain append( ), insert( ) and remove( ) methods with examples. **(08 Marks)**

b. How is tuple different from a list and which function is used to convert list to tuple. **(05 Marks)**

c. Create a function to print out a blank tic – tac – toc board. **(07 Marks)**

OR

4 a. Discuss get( ), item( ), keys( ) and values( ) Dictionary methods in python with examples. **(08 Marks)**

b. With example code explain join( ) and split( ) string methods. **(06 Marks)**

c. Develop a program to accept a sentence form the user and display the longest word of that sentence along with its length. **(06 Marks**

Module-3

5 a. What are regular expression? Describe question mark, star, plus-and dot Regex symbols with suitable python code snippet. **(09 Marks)**

b. With code snippet, explain saving variables using the shelve module and PPrint Pformat( ) functions. **(06 Marks)**

c. Write a program that reads a string with five characters which starts with 'a' and ends with 'z'. Print search successful if pattern matches string. **(05 Marks)**

OR

6 a. Explain functions of Shutil Module with examples. **(08 Marks)**

b. Explain buttons in the Debug control widow. **(05 Marks)**

c. What is meant by compressing files? Explain reading, extracting and creating ZIP files with code snippet. **(07 Marks)**

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Module-4

7 a. What is class, object, attributes. Explain copy·copy( ) with an example. **(06 Marks)**
b. Demonstrate pure functions and modifiers with examples. **(08 Marks)**
c. Use the datetime module to write a program that gets the current date and prints that day of the week. **(06 Marks)**

OR

8 a. Explain operator overloading and polymorphism with examples. **(08 Marks)**
b. Illustrate the concepts of inheritance and class diagrams with examples. **(08 Marks)**
c. Write a function called print time that takes a time object and print it in the form hour : minute : second. **(04 Marks)**

Module-5

9 a. Explain parsing HTML with the BeautifulSoup Module with code snippet for creating finding an element and getting data. **(09 Marks)**
b. What methods do Selenium's web element object have for simulating mouse clicks and keyboard keys. Explain with python code snippet. **(06 Marks)**
c. Write a python program to access cell in a worksheet. **(05 Marks)**

OR

10 a. Write a program to get a list of all files with the pdf extension in the current working director and sort them. **(06 Marks)**
b. Demonstrate the json module with python program. **(06 Marks)**
c. What are the advantages of CSV files? Explain the Reader objects and Writer objects with python code. **(08 Marks)**

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20MBAFM304

Third Semester MBA Degree Examination, Feb./Mar. 2022
Direct Taxation

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FOUR full questions from Q1 to Q7.*
2. Question No. 8 is compulsory.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

1 a. What is MAT? **(03 Marks)**

b. Mr. Vishal (resident) was employed in a company. He retired from service on 1/1/2021 after completing 30 years of service. From 1/07/19, his pay scale was Rs. 8000 – 200 – 10,000 – 300 – 13000 and with DA@20% of his pay. He had 7 month earned leave to his credit (on the basis of 30days per year), which was approved. Hence he was paid Rs. 57000 as salary and Rs.11,480 as DA. Compute the taxable leave encashment for the A.Y 2021-22 ignoring Alternative tax regime. **(07 Marks)**

c. Mrs. Vinaya, a citizen of India went to England on 2/10/2014 for higher studies for a period of two years. After she come back, she was employed in a multinational company in India. The company sent her for 6 months training to Germany on 1/3/2017. She was transferred to the company's head office in New York on 15/8/2018. However she left India on 2/10/2018 and reported for duty on 5/10/2018. She visited India during the month of Nov and Dec 2019. The company transferred her back to her original post in India and she returned to India on 26/10/2021. Determine her residential status for the A.Y.21-22. **(10 Marks)**

2 a. What is capital gain? Name any two. **(03 Marks)**

b. Mr. Tony, marketing specialist is working with two companies – Alpha Co. and Beta Co. He retires from Alpha company on 30/11/2015 and receives Rs. 22,000 as gratuity out of which Rs.20,000 is exempt. He also retries from Beta Company on 10/12/2020 after 28 years and 8 months of from service and receives Rs.2,90,000 as gratuity. His average basic salary draw form Beta Company for proceeding 10 months ended on 30/11/2020 is Rs.18,200. Besides, he had received Rs.1000 p.m as DA 80% of which forms part of salary and 6% commission on turnover achieved by him during 10 months ending on 30/11/2020 his total turnover achievement is Rs.2,00,000. Find out taxable amount of gratuity for the A.Y.2021-22 ignoring Alternative tax regime. **(07 Marks)**

c. Mrs. Hema (age 42 years) is working as a director in Maruthi Suzuki Ltd., Mumbai her salary income detail as follows :
Basic Salary Rs. 21,000p.m, Bonus 2 months basic pay. Commission 3% on sales. During the year she reached a sales target Rs.50,00,000. DA forming part of salary Rs. 7,000 p.m. Medial allowance Rs. 1400p.m (medical expenses were Rs.20,000). Entertainment allowance Rs.3,000 p.m, Children's hostel allowances for her two children @ Rs.500p.m, per child Rs.12000. RPF company's contribution Rs.6,000p.m RPF own contribution Rs.5000p.m. Diwali gift Rs.7000, holiday home facility at Kulu @26,000. Rent free furnished accommodation in Mumbai for which company pays monthly rent of Rs.10,000 and cost of furniture is Rs.60,000. Honda city car above 1600CC has been provide along with driven for both private and official use. Company owns the car and spent Rs.55000 on petrol and Rs.36,000 on drivers salary. Hema paid professional tax Rs.2400. compute taxable salary for the A.Y.2021-22 (Ignore Alternative tax regime). **(10 Marks)**

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20MCA11

First Semester MCA Degree Examination, July/August 2021
Data Structures with Algorithms

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

1 a. What are data structures? Explain the classification of data structures with neat diagram. **(06 Marks)**

b. Define prefix and postfix expression. Write a program to convert infix to postfix expression. **(10 Marks)**

c. Explain polish and reverse polish expression. **(04 Marks)**

2 a. Define stack. Write a program to implement basic operation of stack. **(08 Marks)**

b. Convert the following expression to prefix and postfix expression:
i) $(A + B \cap C) / D + E$
ii) $A * B/C + (B + C) * D$ **(06 Marks)**

c. Write a program to evaluate postfix expression. **(06 Marks)**

3 a. What is recursion? Write a program to generate n Fibonacci series, using recursion. **(10 Marks)**

b. What is Queue? Explain various types of Queue and operation performed on it. **(10 Marks)**

4 a. Define circular Queue. Explain its advantages over ordinary Queue, write a function to demonstrate insert and delete operation on circular Queue. **(10 Marks)**

b. Explain in detail on:
i) Priority Queue
ii) Factorial of a number using recursion. **(10 Marks)**

5 a. Discuss about different types of memory management functions. **(10 Marks)**

b. Write a function for each of the following operation of linked list:
i) Insertion of node at the beginning.
ii) Insertion of node at the end.
iii) Insertion of node at a given position. **(10 Marks)**

6 a. Explain linked implementation of stacks with suitable diagrams, write algorithm to implement stack push and pop operation using singly linked list. **(10 Marks)**

b. Differentiate:
i) Static and dynamic memory allocation.
ii) getnode( ) and freenode( ) operations. **(10 Marks)**

7 a. Define algorithm. Explain the steps involved in algorithm design and analysis process with a neat diagram. **(10 Marks)**

b. List out important problem types. Explain any 5 of them. **(10 Marks)**

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8 a. What is asymptotic notation? List and explain the asymptotic notations. **(10 Marks)**

b. List the steps involved in analyzing the time efficiency of recursive algorithm. Explain the tower of Hanoi problem and analyze its efficiency. **(10 Marks)**

9 a. Write an algorithm for merge sort and find its time complexity of merge sort. **(10 Marks)**

b. Write an algorithm to sort given n elements using bubble sort and obtain an expression for number of times basic operation is executed. **(05 Marks)**

c. Obtain the topological ordering of the given graph by using the source removal method. (Refer Fig.Q.9(c)). **(05 Marks)**

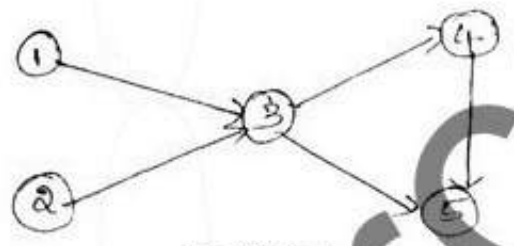


Fig.Q.9(c)

10 a. Write a Prim's algorithm. Apply this algorithm to the following graph to construct minimum spanning tree. (Refer Fig.Q.10(a)). **(10 Marks)**

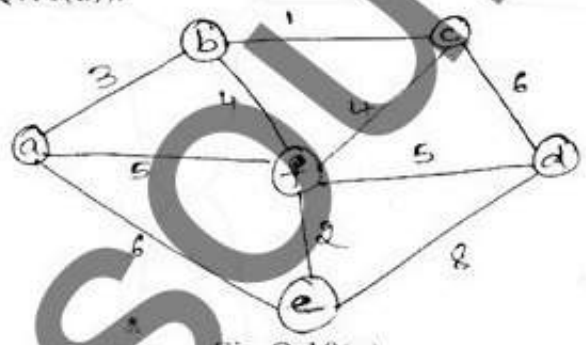


Fig.Q.10(a)

b. Obtain the shortest distance and shortest path from "a" node to all other nodes in a graph. (Refer Fig.Q.10(b)). **(10 Marks)**

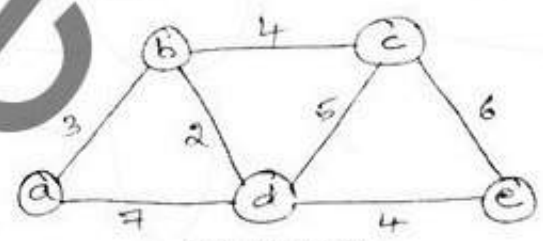


Fig.Q.10(b)

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Fourth Semester B.E. Degree Examination, July/August 2022
Fluid Mechanics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define following and mention their units :
i) Mass density
ii) Dynamic viscosity
iii) Surface tension
iv) Bulk modulus. **(08 Marks)**

b. A U – tube manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipe line. Its left end is connected to the pipe and the right limb is open to the atmosphere. The centre of the pipe is 100mm below the level of mercury (specific gravity = 13.6) in the right limb of the difference of mercury level in the two limbs is 160mm, Determine the absolute pressure of the oil in the pipe. **(08 Marks)**

OR

2 a. Define the following terms :
i) Buoyancy
ii) Centre of Buoyancy
iii) Meta centre
iv) Meta centric height. **(06 Marks)**

b. A circular plate 1.5m diameter is submerged in water, with its greatest and least depths below the surface being 2m and 0.75m respectively.
Determine :
i) The total pressure on one face of the plate
ii) The position of the centre of pressure. **(10 Marks)**

Module-2

3 a. Derive the continuity equation for 3 dimensions in Cartesian co-ordinates. **(10 Marks)**

b. What is the irrotational velocity field associate with the potential
$\phi = 3x^2 - 3x + 3y^2 + 16t^2 + 12zt$.
Does the flow field satisfy the incompressible continuity equation? **(06 Marks)**

OR

4 a. Derive Euler's equation of motion and obtain an expression for Bernoulli's equation from Euler's equation of motion and also mention the assumptions made. **(10 Marks)**

b. A jet of water of 60mm diameter strikes a curved vane at its centre with a velocity of 18m/s. The curved vane is moving with a velocity of 6m/s in the direction of the jet. The jet is deflected through an angle of 165°. Assuming the plate to be smooth find :
i) Thrust on the plate in the direction of jet
ii) Power of the jet
iii) Efficiency of the jet. **(06 Marks)**

Module-3

5 a. Derive Hagen-Poisoulle's equation for viscous flow through a circular pipe. **(10 Marks)**

b. Oil of specific gravity 0.82 is pumped through a horizontal pipeline 150mm in diameter and 3km long at the rate of $0.015 m^3/s$. The pump has an efficiency of 68% and required 7.5KW to pump the oil.

i) What is the dynamic viscosity of the oil

ii) Is the flow Laminar? **(06 Marks)**

OR

6 a. Derive Darcy's equation for head losses due to friction in a circular pipe. **(08 Marks)**

b. Three pipes of diameters 300mm, 200mm and 400mm and length 450mm, 255m and 315m respectively are connected in series. The difference in water surface levels in two tanks is 18m. Determine the rate of flow of water if co-efficient of friction are 0.0075, 0.0078 and 0.0072 respectively considering : i) Minor losses ii) Neglecting minor losses. **(08 Marks)**

Module-4

7 a. Explain the terms :

i) Boundary layer thickness

ii) Displacement thickness

iii) Momentum thickness

iv) Energy thickness. **(06 Marks)**

b. The velocity distribution in the boundary layer is given by $\frac{u}{U} = \frac{Y}{\delta}$, where u is the velocity at a distance y form the plate and $u = U$ at $y = \delta$, δ being the boundary layer thickness. Find :

i) The displacement thickness

ii) The momentum thickness

iii) The energy thickness

iv) The value of δ^*/θ. **(10 Marks)**

OR

8 a. Explain the terms lift and drag on airfoil. **(04 Marks)**

b. Using Buckingham's theorem, show that the velocity through a circular orifice is given by

$$V = \sqrt{2gH}\ \ \phi\left[\frac{D}{H}, \frac{\mu}{\rho VH}\right]$$

where H = head causing flow, D = Diameter of the orifice, μ = co-efficient of viscosity, ρ = Mass density and g = Acceleration due to gravity. **(12 Marks)**

Module-5

9 Write short notes on :

a. Internal energy and enthalpy

b. Speed of sound

c. Stagnation and sonic properties

d. Normal and oblique shocks. **(16 Marks)**

OR

10 Write short notes on :

a. Necessity of CFD

b. Limitations of CFD

c. Philosophy behind CFD

d. Applications of CFD. **(16 Marks)**

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