CARE

COLLEGE OF ENGINEERING

(Approved by AICTE, New Delhi, Affiliated by Anna University, Chennai)

CRITERION 1.1.1

COURSE FILE

Course Name	**Digital Communication**
Course Code	**EC 8501**
Department/ Semester	**III ECE / V**
Academic Year	**2021-2022 (ODD SEMESTER)**

CARE COLLEGE OF ENGINEERING

III,V,VII Semester 2021-22 Academic Calendar

Aug-21				Sep-21				Oct-21				Nov-21				Dec-21				Jan-22			
Date	Day	Events	WD	Date	Day	Events	WD	Date	Day	Events	WD	Date	Day	Events	WD	Date	Day	Events	WD	Date	Day	Events	WD
1	Sun	Holiday	#	1	Wed	CCM 1 : ECE, ME	11	1	Fri		30	1	Mon	Unit 4 Completion, Audit report of CT2 QPS	49	1	Wed			1	Sat	New Year	#
2	Mon			2	Thu	CCM 1 : AI, CE, CSE; UT1- QPs Collection	12	2	Sat	Gandhi Jeyanthi	#	2	Tue		50	2	Thu			2	Sun	Holiday	#
3	Tue			3	Fri	Unit 1 Completion; Audit report of UT1 QPS	13	3	Sun	Holiday	#	3	Wed		51	3	Fri			3	Mon		
4	Wed			4	Sat	UT1	#	4	Mon		31	4	Thu	Deepavali	#	4	Sat			4	Tue		
5	Thu			5	Sun	Holiday	#	5	Tue		32	5	Fri		52	5	Sun	Holiday	#	5	Wed		
6	Fri			6	Mon	UT1	#	6	Wed		33	6	Sat	CT2	#	6	Mon			6	Thu		
7	Sat			7	Tue	UT1	#	7	Thu		34	7	Sun	Holiday	#	7	Tue			7	Fri		
8	Sun	Holiday	#	8	Wed		14	8	Fri	CCM 2 : AI, CE, CSE	35	8	Mon	CT2	#	8	Wed			8	Sat		
9	Mon	Course File Auditing by IQAC Audit Team		9	Thu		15	9	Sat	CCM 2 : ECE, ME; UT2- QPs Collection	36	9	Tue	CT2	#	9	Thu			9	Sun		
10	Tue	Road Map to be planned for the academic year 2021-2022 by all HODs as per the Faculty Perspective plan		10	Fri	Vinayagar sathurthi	#	10	Sun	Holiday	#	10	Wed	CCM 3 : AI, CE, CSE	53	10	Fri			10	Mon		
11	Wed	Review of Auditing Report of Course file auditing		11	Sat	UT1-Answer Script Auditing	16	11	Mon	Unit 3 Completion; Audit report of UT2 QPS	37	11	Thu	CCM 3 : ECE, ME	54	11	Sat			11	Tue		
12	Thu	Course File Re-auditing by IQAC corrective actions reported on 09 to 11.08.2021 - to complete all NCs		12	Sun	Holiday	#	12	Tue	UT2	#	12	Fri		55	12	Sun	Holiday	#	12	Wed		
13	Fri			13	Mon		17	13	Wed	UT2	#	13	Sat		56	13	Mon			13	Thu		
14	Sat			14	Tue		18	14	Thu	Saraswathi Pooja	#	14	Sun	Holiday	#	14	Tue			14	Fri	Pongal Holiday	#
15	Sun	Holiday - Independence day	#	15	Wed		19	15	Fri	Vijayadasami	#	15	Mon	Model- QPs Collection	57	15	Wed			15	Sat	Pongal Holiday	#
16	Mon			16	Thu		20	16	Sat	UT2	#	16	Tue		58	16	Thu			16	Sun	Pongal Holiday	#
17	Tue			17	Fri		21	17	Sun	Holiday	#	17	Wed	Audit report of Model QPS	59	17	Fri			17	Mon		
18	Wed	Reopening Day (III, V, VII Sem)	1	18	Sat		22	18	Mon	CE : Symposium; UT2-Answer Script Auditing	38	18	Thu	Unit 5 syllabus completion	60	18	Sat			18	Tue		
19	Thu		2	19	Sun	Holiday	#	19	Tue	Miladun Nabi	#	19	Fri	Revision; Collection of Course End Feedback from students	61	19	Sun	Holiday	#	19	Wed		
20	Fri	Moharam	#	20	Mon	CT1- QPs Collection	23	20	Wed	ME : Symposium	39	20	Sat	Revision; Collection of Student's Feedback(II) on Faculty	62	20	Mon			20	Thu	Univ.Exam starts	
21	Sat	Monday Order	3	21	Tue		24	21	Thu		40	21	Sun	Holiday	#	21	Tue			21	Fri		
22	Sun	Holiday	#	22	Wed	Unit 2 Completion, Audit report of CT1 QPS	25	22	Fri		41	22	Mon	Model Examination	63	22	Wed			22	Sat		
23	Mon		4	23	Thu	CT1	#	23	Sat		42	23	Tue	Model Examination	64	23	Thu			23	Sun		
24	Tue		5	24	Fri	CT1	#	24	Sun	Holiday	#	24	Wed	Model Examination	65	24	Fri			24			
25	Wed	Association Inaguration CE	6	25	Sat	CT1	#	25	Mon		43	25	Thu	Model Examination	66	25	Sat	Christmas		25			
26	Thu	Association Inaguration CSE, AI	7	26	Sun	Holiday	#	26	Tue		44	26	Fri	Model Examination	67	26	Sun			26			
27	Fri	Association Inaguration ECE	8	27	Mon		26	27	Wed		45	27	Sat	Model Examination	68	27	Mon			27			
28	Sat	Association Inaguration ME	9	28	Tue		27	28	Thu	CT2- QPs Collection	46	28	Sun	Holiday	#	28	Tue			28			
29	Sun	Holiday	#	29	Wed	CT1-Answer Script Auditing	28	29	Fri		47	29	Mon			29	Wed			29			
30	Mon	Krishna Jeyanthi	#	30	Thu		29	30	Sat		48	30	Tue			30	Thu			30			
31	Tue		10					31	Sun	Holiday	#					31	Fri			31			
		Working Days	10			Working Days	19			Working Days	19			Working Days	22			Working Days	1			Working Days	19

Total Working Days : 10+19+19+22+1 + UT,CT Days 12 = 83 Working Days

PRINCIPAL

Department of ECE Activity Plan - ODD Sem - 2021-2022

S.No	Date	Event	Program	Date
1	22.7.2021	Newsletter(COMPLETED)		July
2	30.7.2021	Contest for School Students/ Technical(COMPLETED)	Out Reach Program	1st week August
3	23.8.2021	1.FDP on "IoT" (In association with MoU Company)(COMPLETED) 2. Placement Training/ Govt Exams Training week (COMPLETED)	FDP	2nd week August
6	20.9.201	Patient Monitoring System(COMPLETED)	Proposal for consultancy	3rd week september
7	27.9.2021	FDP on Photonics in Association with IEEE Photonics Society (COMPLETED)	FDP	4th week september
8	1.10.2021	Inter departmental Cutural Activity	Co- Curricular Activity	5th week september
9	1.10.2022	Paper Presentation for department students	Co- Curricular Activity	5th week september
10	4.10.2021	Project Expo (School & Polytechnic Students)	Out Reach Program	1st week October
12	7.10.2021	Alumni Meet(Interaction)	Alumni guest lecture	1st week October
13	22.10.2021	TechnoFrenzy(Technical Events for Department Students)	Co- Curricular Activity	2nd week October
15	28.10.2021	Mini Project Expo	Co- Curricular Activity	4th week October
16	30.10.2021	Workshop on CST Tools	Workshop	5th week October
17	5.11.2021	Outreach program (Schools nearby)	Out Reach Program	1st week November
18	6.11.2021	Industrial visit (Siemens Centre)		1St week November
20	4.12.2021	International Conference	International Conference	2 nd week December
21	18.12.2021	VAC, Internships & Industrial Training (In association with Teslaminds & Siemens centre of excellence)	Value added Course - 2	Semester Break
	27.12.2021	Hackathon		

J. Jeyarani

Dr.J.Jeyarani

HOD/ECE

Date: 27.07.2021

CENTRE FOR ACADEMIC COURSES

ANNA UNIVERSITY: : CHENNAI – 600 025

ACADEMIC SCHEDULE FOR NON AUTONOMOUS AFFILIATED COLLEGES

August 2021 – December 2021 (ODD SEMESTER)*

UG & PG Programmes

Sl. No.	Programme	Semester	Commencement of Classes	Last working day	Commencement of Practical Examinations	Commencement of End Semester Examinations
1.	B.E. / B.Tech.(Full-Time)	III, V, VII	18.08.2021	30.11.2021**	02.12.2021	13.12.2021
2.	B.E. / B.Tech (Part-Time)	III, V, VII				
3.	B.Arch. (Full-Time)	III, V, VII, IX				
4.	M.C.A. (Full-Time)	V				
5.	M.Sc (5 Yrs-Integrated)	V, VII, IX				
6.	M.B.A. (5 Yrs-Integrated)	V, VII, IX				

* As per the directives of the Government of Tamil Nadu, the classes will be conducted in ONLINE mode

RE - OPENING DAY FOR THE NEXT SEMESTER: 19.01.2022 (Wednesday)

NOTE:

1. The Theory and Practical Examination schedules will be published in due course (Practical Examinations will be conducted before the theory examinations).
2. If necessary, loss of classes due to various curricular / co-curricular activities of the department / college may be compensated by conducting classes on Saturdays.

** In order to ensure minimum no. of working days, the following 7 Saturdays are declared as working days.

Sl. No.	Working Days (Saturdays)	Time Table of the Week Day to be Followed
1.	28.08.2021	Friday
2.	11.09.2021	Monday
3.	25.09.2021	Friday
4.	09.10.2021	Thursday
5.	23.10.2021	Friday
6.	06.11.2021	Tuesday
7.	20.11.2021	Thursday

27.07.2021

DIRECTOR
ACADEMIC COURSES

DAC - SB

REGISTRAR

ANNA UNIVERSITY

SARDAR PATEL ROAD, CHENNAI - 600 025.
www.annauniv.edu

Phone : +91 44 2235 2161
+91 44 2235 7003
Office : +91 44 2235 7004
Fax : +91 44 2235 1956
E-Mail : registrar@annauniv.edu

Letter No.4764/AU/CAC/IA-ESE/2021 24.11.2021

To
The Deans of Regional Campuses /
The Deans of Constituent Colleges /
The Principals of the Non-Autonomous Affiliated Colleges.

Sir/Madam,

Ref: 1. G.O. (Ms) No. 164, Higher Education (A2) Department, dated:27:08.2021.
2. Letter No.14595/A2/2021-1, dated: 16.11.2021.
3. G.O. (Ms) No. 234, Higher Education (A2) Department, dated: 22.11.2021.
4. Letter No.14595/A2/2021-1, dated: 22.11.2021.

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With regard to the references cited above, it is directed that necessary steps shall be taken to implement the following instructions scrupulously.

i. All classes should be conducted in offline mode (physical classes) on all six days a week (including Saturday) for the current semester.
ii. Reschedule the theory examinations after January 20, 2022 onwards. Further, ensure that the already scheduled examination dates are revised accordingly and send the revised schedule to this office on or before 30.11.2021.
iii. Conduct Model examinations for students prior to Semester / final examinations.
iv. Provide course materials to students for preparation.
v. Conduct revision classes in institutions where the syllabus has been completed, especially on online mode, so that the student could grasp and understand the subjects in a much better manner.

In view of the above instructions the End Semester Examinations for all the UG/PG students studying in Non-Autonomous Colleges Affiliated to Anna University shall be scheduled from 21.01.2022 onwards. The extended academic schedule is shown in the Table below:

I. **UG and PG Odd Higher Semester (Except Semester III M.E./ M. Tech./M. Arch.(FT)/ M.B.A./M.B.A. (5 Yrs-Integrated) / M.C.A. (FT)).**

Sl. No.	Programme	Semester	Last working day		Commencement of Practical Examinations		Commencement of End Semester Examinations	
			Existing	Revised	Existing	Revised	Existing	Revised
1.	B.E. / B.Tech.(FT)	III, V, VII	30.11.2021	20.01.2022	02.12.2021	03.01.2022	13.12.2021	21.01.2022
2.	B.E. / B.Tech (Part-Time)	III, V, VII						
3.	B.Arch. (FT)	III, V, VII, IX						
4.	M.C.A. (FT)	V						
5.	M.Sc (5 Yrs-Integrated)	V, VII, IX						
6.	M.B.A. (5 Yrs-Integrated)	V, VII, IX						

II. **Semester III - M.E./ M. Tech./M. Arch.(FT)/ M.B.A./M.B.A. (5 Yrs-Integrated)**

Sl. No.	Programme	Semester	Last working day		Commencement of Practical Examinations		Commencement of End Semester Examinations	
			Existing	Revised	Existing	Revised	Existing	Revised
1.	M.B.A.(FT)	III	31.12.2021	20.01.2022	03.01.2022	03.01.2022	19.01.2022	21.01.2022
2.	M.B.A. (5 Yrs-Integrated)	III						
3.	M.E./ M.Tech. / M. Arch.	III						

III. **Semester III - M.C.A. (FT)**

Sl. No.	Programme	Semester	Last working day		Commencement of Practical Examinations		Commencement of End Semester Examinations	
			Existing	Revised	Existing	Revised	Existing	Revised
1.	M.C.A.(FT)	III	06.01.2022	20.01.2022	08.01.2022	03.01.2022	24.01.2022	21.01.2022

REGISTRAR i/c

Copy to:

1. PS to Vice Chancellor
2. PA to Registrar
3. The Chairpersons, Faculty of Civil / Mechanical / Electrical / ICE / Technology / Management Sciences / S&H / Architecture & Planning, AU, Ch – 25.
4. Office of the Controller of Examinations
5. The Stock File, CAC.

ANNA UNIVERSITY:: CHENNAI 600 025

Internal Assessment Schedule for Non Autonomous Affiliated Institutions

August - December 2021 - For all UG/PG - Programmes (ODD SEMESTER) – Except M.C.A 2 Years

Report No	Report Period	Test Period	Report Entry Period
I	18-08-2021 – 13-09-2021	----	13-09-2021 – 18-09-2021
II	14-09-2021 – 07-10-2021	01-10-2021 – 07-10-2021	07-10-2021 – 13-10-2021
III	08-10-2021 – 05-11-2021	29-10-2021 – 05-11-2021	05-11-2021 – 11-11-2021
IV	06-11-2021 – 30-11-2021	23-11-2021 – 30-11-2021	30-11-2021 – 02-12-2021

Saturdays may be included as working days to make good the Shortages, if any.

01.09.2021

CONTROLLER OF EXAMINATIONS

01/09/2021

01-09-2021

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STUDENT NOMINAL ROLL

Year / Sem: III / V **Batch: 2019 – 2023**

B.E. ELECTRONICS & COMMUNICATION ENGINEERING

S. No.	Roll No.	Register No.	Student Name
01	B19001	810719106001	Adithya P
02	B19002	810719106002	Ajay Kumar K
03	B19003	810719106003	Citybabu M
04	B19004	810719106004	Dhinakaran S
05	B19005	810719106005	Gunasekaran S
06	B19006	810719106006	Nishanth K
07	B19007	810719106007	Nithya R
08	B19008	810719106008	Raja Rajeswari S
09	B19009	810719106009	Vijei R

M.Shiva Shankari
Mentor/Class Advisor

Dr.J.Jeyarani
HOD

CARE

COLLEGE OF ENGINEERING

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27, Thayanur, Trichy - 620009

DEPARTMENT OF ECE

ABC Analysis

Category	*Roll / Reg. No.*	*Name*
A	810719106001	Adithya P
	810719106008	Raja Rajeswari S
	810719106005	Gunasekaran S
B	810719106006	Nishanth K
	810719106009	Vijei R
	810719106003	Citybabu M
	810719106007	Nithya R
C	810719106004	Dhinakaran S

M.Shiva Shankari
Mentor/Class Advisor

Dr.J.Jeyarani
HOD

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COURSE INFORMATION SHEET

PROGRAMME: **Electronics and Communication Engineering**	DEGREE: **B.E.**
COURSE: **Digital Communication**	SEMESTER: **V** CREDITS: **03**
COURSE CODE: **EC 8501** REGULATION: **R 2017**	COURSE TYPE: **CORE**
COURSE AREA/DOMAIN: **Communication Systems**	CONTACT HOURS: **3 hours/Week.**
CORRESPONDING LAB COURSE CODE (IF ANY): **EC 8561**	LAB COURSE NAME: **Communication Systems Laboratory**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**INFORMATION THEORY** - Discrete Memoryless source, Information, Entropy, Mutual Information - Discrete Memoryless channels – Binary Symmetric Channel, Channel Capacity - Hartley - Shannon law - Source coding theorem - Shannon - Fano & Huffman codes	9
II	**WAVEFORM CODING & REPRESENTATION** - Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear Predictive Coding- Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester	9
III	**BASEBAND TRANSMISSION & RECEPTION** - ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding - Eye pattern – Receiving Filters- Matched Filter, Correlation receiver, Adaptive Equalization	9
IV	**DIGITAL MODULATION SCHEME** - Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers - Principle of DPSK.	9
V	**ERROR CONTROL CODING** - Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder.	9
	TOTAL HOURS	45

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T	S. Haykin, —Digital Communications, John Wiley, 2005
R	B. Sklar, —Digital Communication Fundamentals and Applications, 2nd Edition, Pearson Education, 2009
R	B.P.Lathi, —Modern Digital and Analog Communication Systems, 3rd Edition, Oxford University Press 2007.
R	H P Hsu, Schaum Outline Series - —Analog and Digital Communications, TMH 2006
R	J.G Proakis, —Digital Communication, 4th Edition, Tata Mc Graw Hill Company, 2001.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
EC 8392	Digital Electronics	To understand the basics of digital coding signals	03
EC 8352	Signals and Systems	To get the concepts of the sampling process and reconstruction of signals in time domain and frequency domain	03
EC 8491	Communication Theory	To learn the basic of analog and digital signals	04

COURSE OBJECTIVES:

1	To know the principles of sampling & quantization
2	To study the various waveform coding schemes
3	To learn the various baseband transmission schemes
4	To understand the various band pass signaling schemes
5	To know the fundamentals of channel coding

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COURSE OUTCOMES:

S.NO.	DESCRIPTION	PO MAPPING
1	Design PCM systems	a,b,c,d,e,f,k,l
2	Design and implement base band transmission schemes	a,b,c,d,e,f,k,l
3	Design and implement band pass signaling schemes	a,b,c,d,e,f,k,l
4	Analyze the spectral characteristics of band pass signaling schemes and their noise performance	a,b,c,d,e,f,k,l
5	Design error control coding schemes	a,b,c,d,e,f,k,l

GAPES IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

S.NO.	DESCRIPTION	PROPOSED ACTIONS
1	Mat lab simulations for the described systems and detailed analysis	Lab
2	Spread Spectrum Communication	Assignment

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

1	Multipath channels and its classification – NPTEL Videos
2	Multiple access techniques and its types – Guest lecture
3	OFDM Techniques and satellite signals – Industrial Visit

WEB SOURCE REFERENCES:

1	http://www.digimat.in/nptel/courses/video/117104127/L52.html
2	https://www.youtube.com/watch?v=Z0YInk8zXRo
3	https://ieeexplore.ieee.org/document/482187
4	https://www.wisconsin.edu/digital-communication/2015/01/21/case-study- building-the-digital-communications-website
5	ww.itcsoftware.com/casestudy_wireless_communication.html
6	http://femreceren.cat/mireia/files/fernandez-ardevol_2013_in3w_p_1761-5652-1-pb.pdf
7	https://www.maximintegrated.com/en/app-notes/index.mvp/id/1_890
8	http://www.ee.iitm.ac.in/~andrew/videolectures/EE419/
9	www.video.co-learn.in/3t_courses/3TEE1426/lectures/pdf/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓ CHALK & TALK	✓ STUD. ASSIGNMENT	✓ WEB RESOURCES	PPT
✓ LCD	✓ STUD. SEMINARS	☐ ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

✓ ASSIGNMENTS	✓ STUD. SEMINARS	✓ TESTS/MODEL EXAMS	✓ UNIV. EXAMINATION
☐ STUD. LAB PRACTICES	✓ STUD. VIVA	✓ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS		

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ASSESSMENT METHODOLOGIES-INDIRECT

✓ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓ STUDENT FEEDBACK ON FACULTY (TWICE)
✓ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	

Prepared by

Faculty In-charge

M. SHIVA SHANKARI, AP/ECE

Approved by

(HOD)

Dr.J.JEYARANI

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
ACADEMIC YEAR 2021-2022 ODD/ EVEN SEMESTER
TIMETABLE- THIRD YEAR

YEAR: III **SEMESTER: V**

DAY	1	2	3	4	5			
MON	EC8552	GE8077	EC8553	EC8561	Counselling	NA		
TUE	EC8553	EC8551	EC8501	EC8552	EC8563	NA		
WED	EC8501	EC8553	OCE551	EC8562	Placement	NA		
THU	EC8551	EC8552	GE8077	OCE551	Library	NA		
FRI	OCE551	EC8501	EC8551	GE8077	EC8553 - Tutorial	NA		

SL. NO.	CODE	SUBJECT NAME	NAME OF THE STAFF	CREDITS	TOTAL
1	EC8501	Digital Communication	Ms.M.Shivashankari	3	3
2	EC8553	Discrete-Time Signal Processing	Ms.K.Rubitha	4	4
3	EC8552	Computer Architecture and Organization	Mr.A.Kathiravan/CSE	3	3
4	EC8551	Communication Networks	Ms.R.Deepalakshmi	3	3
5	GE8077	Total Quality Management	Dr.J.Jeyarani	3	3
6	OCE551	Air Pollution and Control Engineering	Mr.Shiek Imam/ CE	3	3
7	EC8562	Digital Signal Processing Laboratory	Ms.K.Rubitha	2	1
8	EC8561	Communication Systems Laboratory	Ms.M.Shivashankari	2	1
9	EC8563	Communication Networks Laboratory	Ms.J.Jecintha	2	1
10		Library	Ms.M.Shivashankari		1
11		Training and Placement	Ms.K.Rubitha		1
12		Counselling	Mentors		1
				Total Hours:	25

J. Jeyarani

HoD/ECE

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
ACADEMIC YEAR 2021-2022 ODD SEMESTER

INDIVIDUAL TIMETABLE

DAY	1 09:00 - 09:45	2 10:00 - 10:45	3 11:00 - 11:45	4 12:00 - 12:45	5 02:00 - 02:45			
MON	EC8392		EC8561					
TUE			EC8501					
WED	EC8501		EC8392					
THU				EC8392	Library			
FRI		EC8501						

SL. NO.	CODE	SUBJECT NAME (SEM /YEAR)	NAME OF THE STAFF	CREDITS	TOTAL HOURS
1	EC8501	Digital Communication	Ms.M.Shivashankari	3	3
2	EC8392	Digital Electronics	Ms.M.Shivashankari	3	3
3	EC8561	Communication Systems Laboratory	Ms.M.Shivashankari	2	1
4		Library	Ms.M.Shivashankari		1
		Total Hours			8

Signature of HoD

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DEPARTMENT: ECE

Lesson plan (Micro level)

Faculty Name: M.ShivaShankari Designation: Assistant Professor
Course Code &Name: EC8501 Digital Communication
Academic Year: 2021-2022 Sem/Year:V/III

S.No.	Topics	Planned Date	Mode of Teaching	Reference	Course outcome	Actual date	Remarks
UNIT I-INFORMATION THEORY							
1	Discrete Memoryless source, Information	18.8.21	PPT	T1	CO1	18.8.21	
2	Entropy, Mutual Information	20.8.21	PPT	T1	CO1	24.8.21	
3	Discrete Memoryless channels	21.8.21	PPT	T1	CO1	25.8.21	
4	Binary Symmetric Channel, Channel Capacity	24.8.21	PPT	T1	CO1	28.8.21	
5	Hartley - Shannon law	25.8.21	PPT	T1	CO1	31.8.21	
6	Source coding theorem	27.8.21	PPT	T1	CO2	31.8.21	
7	Shannon - Fano& Huffman codes	28.8.21	PPT	T1	CO2	1.9.21	
8	Tutorial Problems	31.8.21	PPT	T1	CO1	1.9.21	
9	Tutorial Problems	31.8.21	PPT	T1	CO1	1.9.21	
Total No. of Hours prescribed per Unit by Anna University			9				
Total No. of Hours Required as per Lesson Plan			9				
Signature of Faculty			Signature of HOD		J.Jm		
UNIT II WAVEFORM CODING & REPRESENTATION							
10	Prediction filtering and DPCM	1.9.21	PPT	T1	CO2	3.9.21	
11	Delta Modulation	3.9.21	PPT	T1	CO2	8.9.21	
12	ADPCM & ADM principles	8.9.21	PPT	T1	CO2	14.9.21	
13	Linear Predictive Coding	11.9.21	PPT	T1	CO2	15.9.21	
14	Properties of Line codes	14.9.21	PPT	T1	CO2	17.9.21	
15	Power Spectral Density of Unipolar / Polar RZ & NRZ	15.9.21	PPT	T1	CO2	17.9.21	
16	Bipolar NRZ - Manchester	17.9.21	PPT	T1	CO2	28.9.21	
17	Tutorial Problems	18.9.21		T1	CO2	28.9.21	
18	Tutorial Problems	21.9.21	PPT	T1	CO2	28.9.21	
Total No. of Hours prescribed per Unit by Anna University			9				
Total No. of Hours Required as per Lesson Plan			9				
Signature of Faculty			Signature of HOD		J.Jm		
UNIT III BASEBAND TRANSMISSION & RECEPTION							
19	Introduction – ISI	22.9.21	PPT	T1	CO3	29.9.21	
20	Nyquist criterion for distortion less transmission	28.9.21	PPT	T1	CO3	5.10.21	
21	Pulse shaping	29.9.21	PPT	T1	CO3	6.10.21	
22	Correlative coding	1.10.21	PPT	T1	CO3	6.10.21	
23	Eye pattern	5.10.21	PPT	T1	CO3	8.10.21	
24	Receiving Filters- Matched Filter	6.10.21	PPT	T1	CO3	8.10.21	
25	Correlation receiver,	6.10.21	PPT	T1	CO3	25.10.21	
26	Adaptive Equalization	8.10.21	PPT	T1	CO3	25.10.21	

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COLLEGE OF ENGINEERING

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27, Thayanur, Trichy - 620009

DEPARTMENT: ECE

27	Tutorial Problems	8.10.21	PPT	T1	CO3	25.10.21
Total No. of Hours prescribed per Unit by Anna University			9			
Total No. of Hours Required as per Lesson Plan			9			
Signature of Faculty			Signature of HOD		J. Jeya	

UNIT IV DIGITAL MODULATION SCHEME

28	Geometric Representation of signals	20.10.21	PPT	R2	CO4	26.10.21
29	Generation, detection	22.10.21	PPT	R2	CO4	28.10.21
30	PSD & BER of Coherent BPSK	23.10.21	PPT	R2	CO4	30.10.21
31	BFSK & QPSK	26.10.21	PPT	R2	CO4	30.10.21
32	QAM	27.10.21	PPT	R2	CO4	1.11.21
33	Carrier Synchronization	29.10.21	PPT	R2	CO4	1.11.21
34	Structure of Non-coherent Receivers	29.10.21	PPT	R2	CO4	2.11.21
35	Principle of DPSK.	30.10.21	PPT	R2	CO4	2.11.21
36	Tutorial Problems	30.10.21	PPT	R2	CO4	2.11.21
Total No. of Hours prescribed per Unit by Anna University			9			
Total No. of Hours Required as per Lesson Plan			9			
Signature of Faculty			Signature of HOD		J. Jeya	

UNIT V ERROR CONTROL CODING

37	Channel coding theorem	2.11.21	PPT	R4	CO5	12.11.21
38	Linear Block codes	3.11.21	PPT	R4	CO5	12.11.21
39	Hamming codes	5.11.21	PPT	R4	CO5	12.11.21
40	Cyclic codes	12.11.21	PPT	R4	CO5	12.11.21
41	Convolutional codes	13.11.21	PPT	R4	CO5	13.11.21
42	Viterbi Decoder.	13.11.21	PPT	R4	CO5	13.11.21
43	Tutorial Problems	16.11.21	PPT	R4	CO5	13.11.21
44	Tutorial Problems	17.11.21	PPT	R4	CO5	19.11.21
45	Tutorial Problems	17.11.21	PPT	R4	CO5	19.11.21

Total No. of Hours prescribed per Unit by Anna University	9
Total No. of Hours Required as per Lesson Plan	9
Signature of Faculty	Signature of HOD

Total No. of Hours prescribed by Anna University for Completion of the Course	45
Total No. of Hours Required as per Lesson Plan to complete the Course	45
No. of Hours Required for covering Content Beyond Syllabus	2
Total No. of Lecture Hours for Completion of the Course	47

Prepared by	Name: M.ShivaShankari Designation: Assistant Professor	Sign	Shiva Shankari
Approved by	Name:Dr.J.Jeyarani Designation: HOD/ECE	Sign	J. Jeya

CARE COLLEGE OF ENGINEERING

Session Plan

Faculty Name: M.Shiva Shankari
Course Code & Name: EC8501 Digital Communication
Semester: **Odd** / Even
Topics Discussed : Discrete Memoryless source, Information

Designation & Department: AP/ECE
Academic Year: 2021-2022
Class:III Unit: 1
Date of Lecture: 18.8.2021

	Description	Mode of Teaching	Time in Mins	Remarks
1	Recap of Previous Topics/Classes handled	PPT	0	
2	Brief Explanation of Topics to be handled today Shannon' theorem	PPT	7	
3	Explain the concept with analogy Example problems	PPT	3	
4	Pre-requisites of the topic Binary codes	PPT	5	
5	Explanation about the topics/concepts step by step Derivation	PPT	10	
6	Explain with examples Problems practice	Videos	7	Youtube Source
7	Plan for Q&A session / Activities Giving examples	Query ans session	3	
8	Summarization Source, channel	PPT	3	
9	Give the topics to be read by students for next class Practice problems	Assignments	2	

CARE COLLEGE OF ENGINEERING

Session Plan

Faculty Name: M.Shiva Shankari
Course Code & Name: EC8501 Digital Communication
Semester: **Odd** / Even
Topics Discussed : Entropy, Mutual Information

Designation & Department: AP/ECE
Academic Year: 2021-2022
Class:III Unit: 1
Date of Lecture: 20.8.2021

	Description	Mode of Teaching	Time in Mins	Remarks
1	Recap of Previous Topics/Classes handled Source, channel	PPT	5	
2	Brief Explanation of Topics to be handled today Problems	PPT	2	
3	Explain the concept with analogy Giving examples with real time	PPT	3	
4	Pre-requisites of the topic Binary codes	PPT	5	
5	Explanation about the topics/concepts step by step Derivation	PPT	10	
6	Explain with examples Videos	Videos	7	Youtube Source
7	Plan for Q&A session / Activities Quiz	Query ans session	3	
8	Summarization Properties	PPT	3	
9	Give the topics to be read by students for next class Exercise problems	Assignments	2	

CARE COLLEGE OF ENGINEERING

Session Plan

Faculty Name: M.Shiva Shankari
Designation & Department: AP/ECE
Course Code & Name: EC8501 Digital Communication
Academic Year: 2021-2022
Semester: **Odd** / Even
Class:III Unit: 1
Topics Discussed : Discrete Memoryless channels
Date of Lecture: 21.8.2021

	Description	Mode of Teaching	Time in Mins	Remarks
1	Recap of Previous Topics/Classes handled Memory channels, properties	PPT	5	
2	Brief Explanation of Topics to be handled today Properties	PPT	2	
3	Explain the concept with analogy Capacity of discrete memory	PPT	3	
4	Pre-requisites of the topic Binary codes	PPT	5	
5	Explanation about the topics/concepts step by step Problem analysis	PPT	10	
6	Explain with examples Problems	Videos	7	Youtube Source
7	Plan for Q&A session / Activities Discussion	Query ans session	3	
8	Summarization Comparison of channels	PPT	3	
9	Give the topics to be read by students for next class Murog's method	Assignments	2	

CARE COLLEGE OF ENGINEERING

Session Plan

Faculty Name: M.Shiva Shankari
Designation & Department: AP/ECE
Course Code & Name: EC8501 Digital Communication
Academic Year: 2021-2022
Semester: **Odd** / Even
Class:III Unit: 1
Topics Discussed : Binary Symmetric Channel, Channel Capacity
Date of Lecture: 24.8.2021

	Description	Mode of Teaching	Time in Mins	Remarks
1	Recap of Previous Topics/Classes handled Comparison of channels	PPT	5	
2	Brief Explanation of Topics to be handled today Conditional entropy	PPT	2	
3	Explain the concept with analogy Using properties	PPT	3	
4	Pre-requisites of the topic Binary codes	PPT	5	
5	Explanation about the topics/concepts step by step Capacity of the channel	PPT	10	
6	Explain with examples Example problems	Videos	7	Youtube Source
7	Plan for Q&A session / Activities	Query ans	3	

	Discussion	session		
8	Summarization Comparison	PPT	3	
9	Give the topics to be read by students for next class Different channels used	Assignments	2	

CARE COLLEGE OF ENGINEERING

Session Plan

Faculty Name: M.Shiva Shankari
Course Code & Name: EC8501 Digital Communication
Semester: **Odd** / Even
Topics Discussed : Hartley - Shannon law

Designation & Department: AP/ECE
Academic Year: 2021-2022
Class:III Unit: 1
Date of Lecture: 25.8.2021

Description		Mode of Teaching	Time in Mins	Remarks
1	Recap of Previous Topics/Classes handled Comparison	PPT	5	
2	Brief Explanation of Topics to be handled today Properties	PPT	2	
3	Explain the concept with analogy Need for source encoding	PPT	3	
4	Pre-requisites of the topic Binary codes	PPT	5	
5	Explanation about the topics/concepts step by step Theorem explanation	PPT	10	
6	Explain with examples Videos	Videos	7	Youtube Source
7	Plan for Q&A session / Activities Discussion problems	Query ans session	3	
8	Summarization Code comparison	PPT	3	
9	Give the topics to be read by students for next class Problems	Assignments	2	

Unit 3

Baseband Transmission

Syllabus

Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester- ISI – Nyquist criterion for distortionless transmission – Pulse shaping – Correlative coding - Mary schemes – Eye pattern - Equalization

Baseband Transmission

- The digital signal used in **baseband transmission** occupies the entire bandwidth of the network media to **transmit** a single data signal.
- **Baseband** communication is bidirectional, allowing computers to both send and receive data using a single cable.

Baseband Modulation

- An information bearing-signal must conform to the limits of its channel
- • Generally modulation is a two-step process
- – baseband: shaping the spectrum of input bits to fit in a limited spectrum
- – passband: modulating the baseband signal to the system rf carrier
- • Most common baseband modulation is *Pulse Amplitude Modulation (PAM)*
- – data amplitude modulates a sequence of time translates of basic pulse
- – PAM is a linear form of modulation: easy to equalize, BW is pulse BW
- – Typically baseband data will modulate in-phase [cos] and quadrature [sine] data
- streams to the carrier passband
- • Special cases of ***modulated PAM include***
- – phase shift keying (PSK)
- – quadrature amplitude modulation (QAM)

Need for Baseband Modulation

- An analog signal has a finite bandwidth.
- · A digital stream or signal, with sharp transitions, has an infinite
- bandwidth.
- · Due to the limited available system bandwidth, only the major portion of
- a digital signal spectrum can be transmitted and restored. Even if there is
- no loss or noise in the communication system, the received signal will
- have distortion due to the limited channel bandwidth.
- To avoid or to reduce this signal distortion, we
- use ***baseband modulation techniques***

Line Codes

- In telecommunication, a **line code** (also called digital baseband modulation or digital baseband transmission method) is a **code** chosen for use within a communications system for baseband transmission purposes.
- **Line** coding is often used for digital data transport.
- Line coding consists of representing the digital signal to be transported by an amplitude- and time-discrete signal that is optimally tuned for the specific properties of the physical channel (and of the receiving equipment).
- The waveform pattern of voltage or current used to represent the 1s and 0s of a digital data on a transmission link is called *line encoding*.

Common types of Line Codes

- The common types of line encoding are
- unipolar
- polar
- bipolar
- Manchester encoding

Need for Line Codes

- Various Techniques
- Other Way: From Computers
- Information: Inherently discrete in nature
- Transmitted over band-limited channel: Signal gets Dispersed
- Causes: Overlap and Distortion
- Distortion: Intersymbol Interference(ISI)

Properties of Line Codes

- Transmission Bandwidth: as small as possible
- Power Efficiency: As small as possible for given BW and probability of error
- Error Detection and Correction capability: Ex: Bipolar
- Favorable power spectral density: dc=0
- Adequate timing content: Extract timing from pulses
- Transparency: Prevent long strings of 0s or 1s

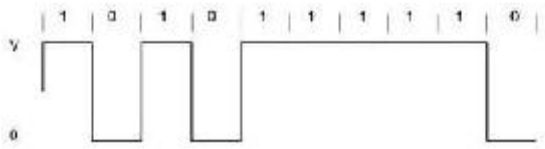
Unipolar coding

- **Unipolar encoding** is a line code. A positive voltage represents a binary 1, and zero volts indicates a binary 0. It is the simplest line code, directly encoding the bitstream, and is analogous to on-off keying in modulation.
- Its drawbacks are that it is not self-clocking and it has a significant DC component, which can be halved by using return-to-zero, where the signal returns to zero in the middle of the bit period.
- With a 50% duty cycle each rectangular pulse is only at a positive voltage for half of the bit period.
- This is ideal if one symbol is sent much more often than the other and power considerations are necessary, and also makes the signal self-clocking.

- **NRZ(Non-Return-to-Zero)** - Traditionally, a unipolar scheme was designed as a non-return-to-zero (NRZ) scheme, in which the positive voltage defines bit 1 and the negative voltage defines bit 0.
- It is called NRZ because the signal does not return to zero at the middle of the bit.
- Compared with its polar counterpart, Uni Polar NRZ, this scheme is very expensive.
- The normalized power (power required to send 1 bit per unit line resistance) is double that for polar NRZ.
- For this reason, this scheme is not normally used in data communications today.

Unipolar Non-Return to Zero (NRZ):

In unipolar NRZ the duration of the MARK pulse ( ) is equal to the duration (T_b) of the symbol slot.



Correlative Coding and Equalization

- Correlative Coding
  - ❖For zero ISI, the symbol rate R = 1/T < 2W, the Nyquist rate.
  - ❖We may relax the condition of zero ISI in order to achieve R = 2W.
- The schemes which allow a controlled amount of ISI to achieve the symbol rate 2W are called correlative coding or partial response signaling schemes.

The condition for zero ISI is

$$p_1(nT) = \begin{cases} 1, & n = 0 \\ 0, & n \neq 0 \end{cases} \qquad (1)$$

Suppose that we design the band-limited signal $p(t)$ to have controlled ISI at one time instant, i.e., to allow one additional nonzero value in the samples $\{p(nT)\}$ for example,

$$p_2(nT) = \begin{cases} 1, & n = 0 \text{ and } n = 1 \\ 0, & \text{otherwise} \end{cases} \qquad (2)$$

$p_2(t)$ has a larger time duration than $p_1(t)$;
$\rightarrow |P(f) = F\,p_2(t)|$ has a smaller bandwidth on frequency domain than $P_1(f) = F[p_1(t)]$;
$\Rightarrow$ Spectral efficiency is increased by using $p_2(t)$

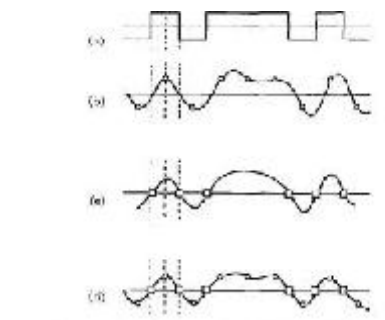
Note. The ISI we introduce by using $p_2(t)$ is deterministic or "controlled" and, hence, its effect on signal detection at the receiver can be removed, as discussed below.

2nd Nyquist Criterion

- Values at the pulse edge are distortionless
- p(t) =0.5, when t= -T/2 or T/2; p(t)=0, when t=(2k-1)T/2, k≠0,1 where -1/T ≤ f ≤ 1/T

$$P_r(f) = \mathrm{Re}\left[\sum_{n=-\infty}^{\infty} (-1)^n P(f + n/T)\right] = T\cos(fT/2)$$

$$P_I(f) = \mathrm{Im}\left[\sum_{n=-\infty}^{\infty} (-1)^n P(f + n/T)\right] = 0$$



Nyquist criterion: (a) input signal; (b) output signal satisfying Nyquist's first criterion—values at pulse centers unchanged; (c) output signal satisfying Nyquist's second criterion—values at pulse edges unchanged; (d) output signal satisfying Nyquist's first and second criteria—values at pulse centers and edges unchanged.

3rd Nyquist Criterion

- Within each symbol period, the integration of signal (area) is proportional to the integration of the transmit signal (area)

$$P(w) = \begin{cases} \dfrac{(wt)/2}{\sin(wT/2)}, & |w| \le \dfrac{\pi}{T} \\ 0, & |w| > \dfrac{\pi}{T} \end{cases}$$

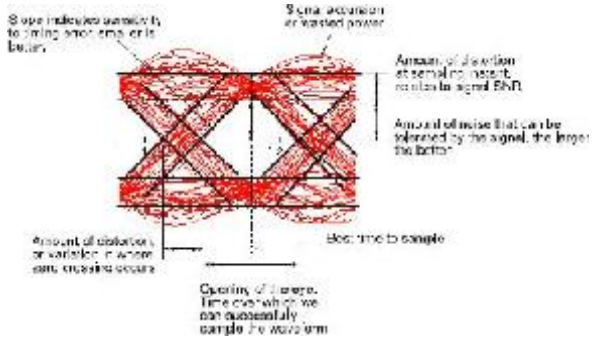
$$p(t) = \frac{1}{2\pi} \int_{-\pi/T}^{\pi/T} \frac{(wt/2)}{\sin(wT/2)} e^{jwt} dw$$

$$A = \int_{\frac{2n-1}{2}T}^{\frac{2n+1}{2}T} p(t)dt = \begin{cases} 1, & n = 0 \\ 0, & n \neq 0 \end{cases}$$

Eye Diagram

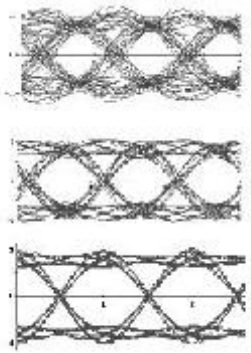
- Eye diagram is a means of evaluating the quality of a received "digital waveform"
  - By quality is meant the ability to correctly recover symbols and timing
  - The received signal could be examined at the input to a digital receiver or at some stage within the receiver before the decision stage
- Eye diagrams reveal the impact of ISI and noise
- Two major issues are 1) sample value variation, and 2) jitter and sensitivity of sampling instant
- Eye diagram reveals issues of both
- Eye diagram can also give an estimate of achievable BER
- Check eye diagrams at the end of class for participation

Interpretation of Eye Diagram

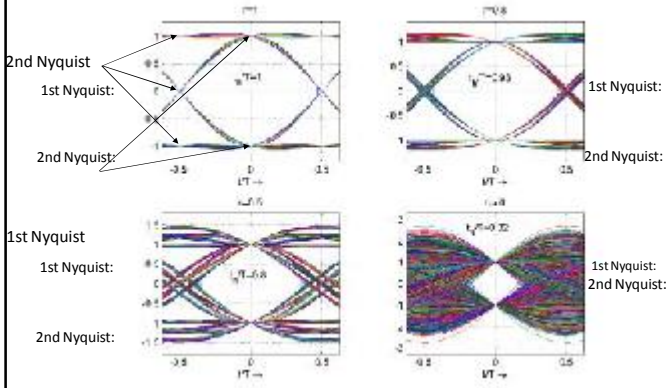


Raised Cosine Eye Diagram

- The larger α, the wider the opening.
- The larger α, the larger bandwidth (1+ α)/Tb
- But smaller α will lead to larger errors if not sampled at the best sampling time which occurs at the center of the eye.

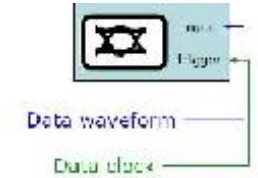


Cosine rolloff filter: Eye pattern



Eye Diagram Setup

- Eye diagram is a retrace display of data waveform
  - Data waveform is applied to input channel
  - Scope is triggered by data clock
  - Horizontal span is set to cover 2-3 symbol intervals
- Measurement of eye opening is performed to estimate BER
  - BER is reduced because of additive interference and noise
  - Sampling also impacted by jitter



Data waveform can be RZ or NRZ, and can be binary or multilevel

Trigger waveform can be any signal synchronous with the data waveform, including the data waveform itself

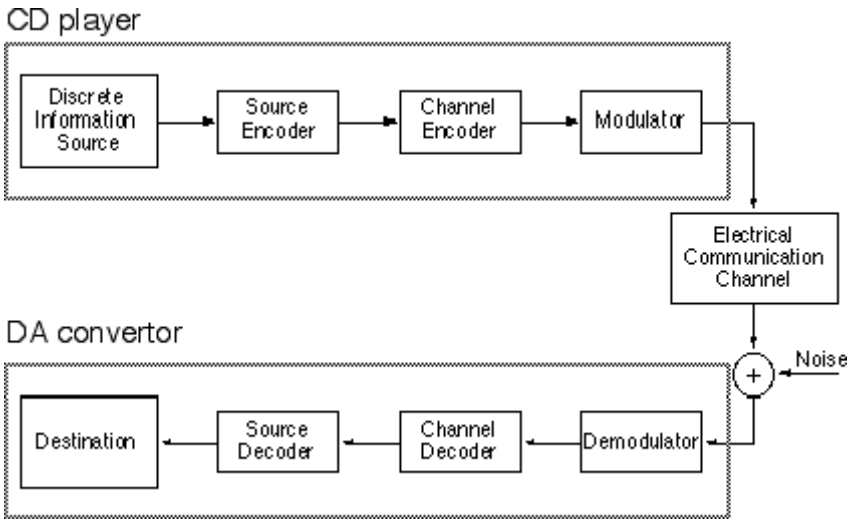
Partial Response Signals

- Previous classes: Sy(w)=|P(w)|^2 Sx(w)
  - Control signal generation methods to reduce Sx(w)
  - Raise Cosine function for better |P(w)|^2
- This class: improve the bandwidth efficiency
  - Widen the pulse, the smaller the bandwidth.
  - But there is ISI. For binary case with two symbols, there is only few possible interference patterns.
  - By adding ISI in a controlled manner, it is possible to achieve a signaling rate equal to the Nyquist rate (2W symbols/sec) in a channel of bandwidth W Hertz.

QUESTION BANK - TWO MARKS AND ESSAY FOR ALL FIVE UNITS

UNIT-I INFORMATION THEORY

1. Draw the typical digital communication system**[AUC NOV/DEC2011]**
[AUC NOV/DEC2012]



2. How can BER of an system be improved.

- Increasing the transmitted signal power
- Employing modulation and demodulation technique
- Employing suitable coding and decoding methods
- Reducing noise interference with help of improved filtering

3. Give an example for time limited and time unlimited signals **[AUC APR/MAY 2011]**
Time limited- rectangular pulse, triangular pulse
Time unlimited signals - sinusoidal signal,exponential signal and step signal.

4. Give the advantages and disadvantages of digital communication. [**AUC APR/MAY 2011]**
Advantage
Speech, video and other data can be transmitted simultaneously
Wide dynamic range is possible since data is digital
DisAdvantage
digital communication required synchronization
data rate are very high

5. Which parameter is called figure of merit of a digital communication system and why?
The ration Eb/No or bit energy to noise power spectral density is called figure of merit of a digital communication system.

6. What is meant by distortion less transmission? **[AUC NOV/DEC 2010]**

For distortion less transmission, the transfer function of the system if given as,

$H(w)=Ke^{-jwto}$

K- Constant magnitude response

The transfer function impose two requirements on the system

1. The system response must have constant magnitude response
2. The system phase shift response must be linear with frequency

7. Why prefilterring done before sampling **[AUC NOV/DEC 2010]**

The signal must be limited to some highest frequency W Hz before sampling.
Then the signal is sampled at the frequency of fs=2W of higher. Hence the single should be prefiltered at higher that W Hz.If the signal is not prefiltered, then frequency component higher that W Hz will generate aliasing in the sampled signal spectrum.

8. Define quantization noise power **[AUC NOV/DEC 2010]**

Quantisation noise power is the noise power due to quantisation noise. Let the quantisation noise has the pdf of f€(€).Then Quantisation noise power is given as,

$E[€]^2 = €^2\ f_€(€)\ d\ €.$

9. State sampling theorem. [**AUC APR/MAY 2011] [AUC APR/MAY 2012]**

A band limited signal of finite energy, which has no frequency components higher than W Hz, may be completely recovered from the knowledge of its samples taken at the rate of 2W samples per second.

10. What is quantization error **[AUC APR/MAY 2011]**

Because of quantization inherent error are introduces in the signal. The error is called Quantization error €=xq(nTs)-x(nTs)

xq(nTs)- quantis ed value of the signal

x(nTs)- value of te sample before quantization

11. Compare uniform and non uniform quantization [AUC NOV/DEC 2011]

S.No	Uniform Quantization	Non-uniform Quantization
1	The quantization step size remains same throughout the dynamic range of the signal	The quantization step size varies with the amplitude of the input signal.
2	SNR ratio varies with the input signal amplitude	SNR ratio can be maintained constant

12. What is meant by quantization. **[AUC APR/MAY 2012]**

The conversion of analog sample of the signal into digital form is called quantizing process

13. Differentiate the principle of temporal waveform coding and model based coding

TEMPORAL WAVEFORM CODING

The signal which varying with time can be digitized by periodic time sampling and amplitude

quantization. This process is called temporal waveform coding .DM,ADM,DPCM are example
of temporal waveform coding

MODEL BASED CODING

The signal is characterised in various parameter. This parameter represent the model of the signal.LPC is an example model based coding.

14. What is meant by aliasing effect?

Aliasing effect takes place when sampling frequency is less than Nyquist rate.Under such condition, the spectrum of the sampled signal overlaps with itself.Hence higher frequencies take the form of lower frequencies. This interference of the frequency components is called aliasing effects.

15. What is the effects of aliasing? How it is reduced?

(i) Since high and low frequencies interfere with each other,distortion is generated.

(ii) The data is lost and it can not be recovered.

Aliasing can be avoided by two methods:

(i) Sampling rate fs ≥ 2W samples/sec. Where W---> Max.frequency present in the signal

(ii)Strictly bandlimit the signal to „W‟Hz.

16. What is the function of Low pass filter on sampling?

A low pass filter basically a reconstruction of filter.This filter should pass all the frequencies between(-W,W), Since original signal was having maximum frequency of „W‟Hz.Therefore cut-off frequency of this low pass reconstruction filter will be „W‟Hz.

17. Define Non-uniform quantization.(AU-Apr‟2015)

In non-uniform quantization, the step size is not fixed. It varies according to certain level of input signal amplitude. Step size is small at low input signal levels and the step size is higher at high input levels. Hence signal to noise power ratio remains almost same throughout the input signal.

18. What is meant by compander?

The non-uniform quantization(variable stepsize „∂‟)becomes very difficult to implement. Therefore the signal is amplified at low signal levels and attenuated high signal levels.After this process,uniform quantization is used.This is equivalent to more stepsize at low signal levels and small step size at high signal levels.At the receiver a reverse process is done.That is the signal is attenuated at low signal levels and amplified at high signal levels to get original signal.Thus the compressionbof signal at transmitter and expansion at receiver is called combinely as Companding.

UNIT-II WAVEFORM CODING

1.What is meant by temporal waveform coding **[AUC NOV/DEC 2011]**

The singal which varying with time can be digitzed by periodic time sampling and amplitude quantization.this process is called temporal waveform coding .DM,ADM,DPCM are example of temporal waveform coding.

2. Differentiate the principle of temporal waveform coding and model based coding.

TEMPORAL WAVEFORM CODING [AUC NOV/DEC 2012]

The signal which varying with time can be digitized by periodic time sampling and amplitude quantization. This process is called temporal waveform coding .DM,ADM,DPCM are exampleof temporal waveform coding.

MODEL BASED CODING

The signal is characterised in various parameter. This parameter represent the model of the signal.LPC is an example model based coding.

3. What is meant by DPSK?

In DPSK, the input sequence is modified. Let input sequence be d(t) and output sequence be b(t). Sequence b(t) changes level at the beginning of each interval in which d(t)=1 and it does not changes level when d(t)=0.

When b(t) changes level, phase of the carrier is changed. And as stated above, b(t) changes t=its level only when d(t) =1. This means phase of the carrier is changed only if d(t)=1. Hence the technique is called Differential PSK.

4. Mention the merits of DPCM.

1 .Bandwidth requirement of DPCM is less compared to PCM.

2. .Quantization error is reduced because of prediction filter

3. .Numbers .of bits used to represent .one sample .value are also reduced compared to PCM.

5. What is the main difference in DPCM and DM?

DM encodes the input sample by one bit. It sends the information about + δ or -δ, ie step rise or fall. DPCM can have more than one bit of encoding the sample. It sends the information about difference .between .actual sample value and the predicted sample value.

6. What is the advantage of delta modulation over pulse modulation schemes?

Delta modulation encodes one bit per samples. Hence signalling rate is reduced in DM.

7. What is meant by adaptive delta modulation?

In adaptive delta modulation, the step size is adjusted as per the slope of the input signal. Step size is made high if slope of the input signal is high. This avoids slope overload distortion.

8.What are the two limitations of delta modulation?
1 Slope of overload distortion.
2. Granular noise.

9. How does Granular noise occurs?
It occurs due to large step size and very small amplitude variation in the input signal.

10. What are the advantages of the Delta modulation?

1. Delta modulation transmits only one bit for one sample. Thus the signalling rate and transmission channel bandwidth is quite small for delta modulation.
2. The transmitter .and .receiver .implementation is very much simple for delta modulation. There is no analog to digital converter involved in delta modulation.

11. What do you understand from adaptive coding?
In adaptive coding, the quantization step size and prediction filter coefficients are changed as per properties of input signal. This reduces the quantization error and number of bits to represent the sample value. Adaptive coding is used for speech coding at low bits rates.

12.Mention the use of adaptive quantizer in adaptive digital waveform cod ing schemes.
Adaptive quantizer changes its .step .size .according variance of .the .input signal. Hence quantization error is significantly reduced due to the adaptive quantization. ADPCM uses adaptive quantization. The bit rate of such schemes is reduced due to adaptive quantization.

UNIT-III BASEBAND TRANSMISSION

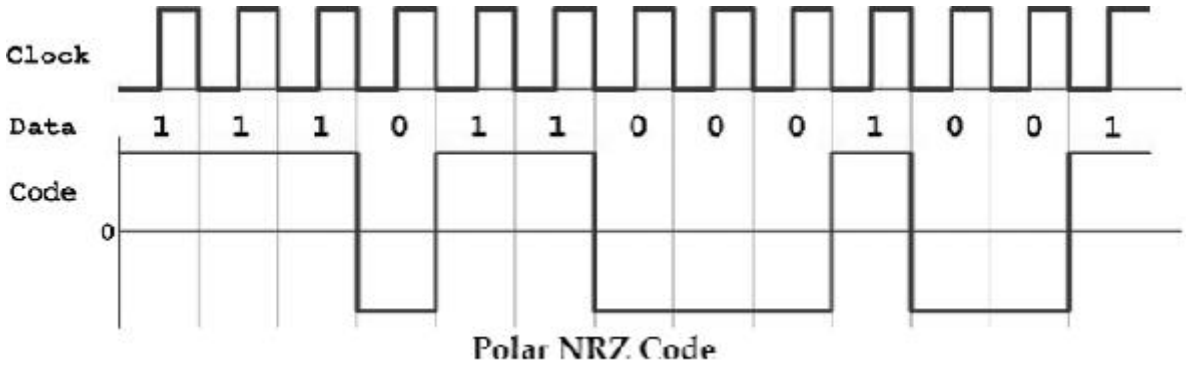
1. What is meant by transparency with respect to line codes [AUC APR/MAY 2011]

   The line code is said to be transparent if the synchronization between the transmitter and receiver is maintained for any type of input data sequence.

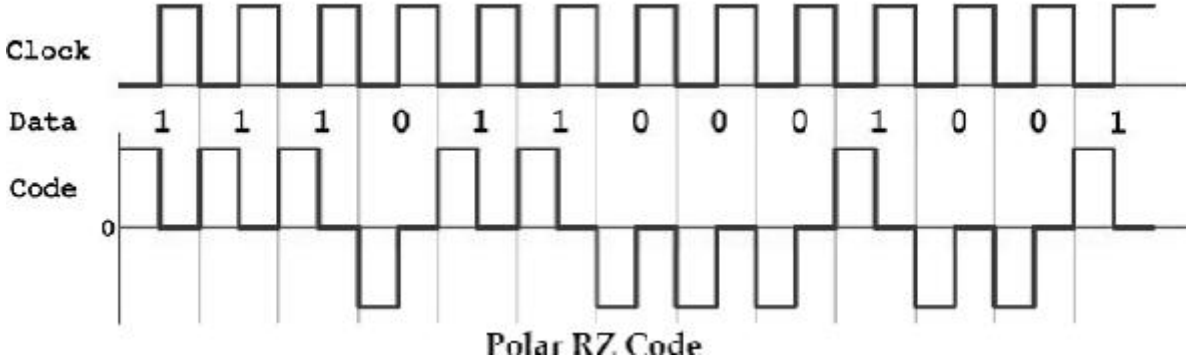
2. Draw the NRZ and RZ code for the digital data 10110001 [AUC APR/MAY 2010]

   [OR]

   Draw the RZ bipolar line code format for the information {10110}[AUC NOV/DEC2011]



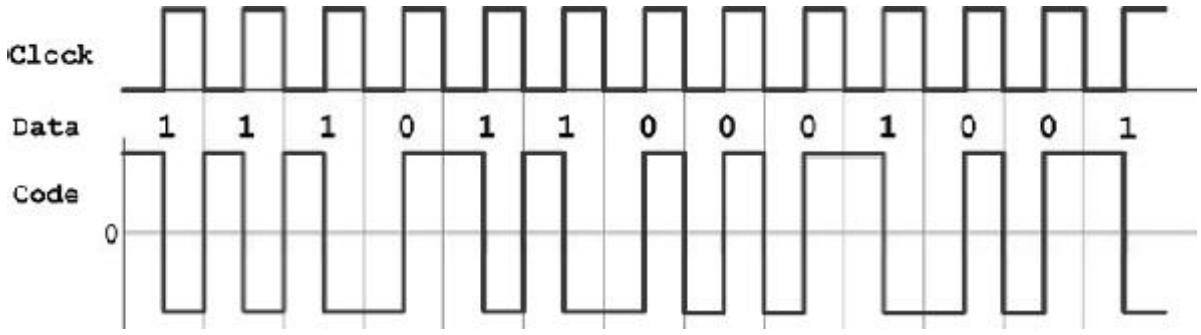
Polar NRZ Code



Polar RZ Code

3. What is Manchester code? Draw the Manchester format for the data stream 10110? [AUC APR/MAY 2012]

In Manchester code each bit of data is signified by at least one transition. Manchester encoding is therefore considered to be self-clocking, which means that accurate clock recovery from a data stream is possible. In addition, the DC component of the encoded signal is zero. Although transitions allow the signal to be self-clocking, it carries significant overhead as there is a need for essentially twice the bandwidth of a simple NRZ or NRZI encoding



4. State any four desirable properties of line code[AUC NOV/DEC 2012]

The PAM signal should have adequate timing content,
The PAM signal should immune to channel noise and interference
The PAM signal should allow error detection and error correction
The PAM signal should be transparent to digital data being transmitted.

5. What is intersymbol interference in baseband binary PAM systems?

In baseband binary PAM, symbols are transmitted one after another. These symbols are separated by sufficient time durations. The transmitter, channel and

receiver acts as a filter to this baseband data. Because of the filtering characteristics, transmitted PAM pulses are spread in time.

6. What is correlative coding?
Correlative level coding is used to transmit a baseband signal with the signalling rate of 2Bo over the channel of bandwidth Bo. This is made physically possible by allowing ISI in the transmitted in controlled manner. This ISI is known to receiver. .The .correlative .coding .is .implemented .by .duobinary .signalling .and modified duobinary signalling.

7. Define Duobinary baseband PAM systemK
Duobinary encoding reduces the maximum frequency of the baseband signal. The word „duo" means to double the transmission capacity of the binary system. Let the PAM signal ak represents kth bit. Then the encoder the new waveform as
C*k* =a*k* + ak-1
Thus two successive bits are added to get encoded value of the kth bit. Hence Ck becomes a correlated signal even though a*k* is not correlated. This introduces intersymbol interference in the controlled manner to reduce the bandwidth.

8. What are eye pattern?
Eye pattern is used to study the effect of ISI in baseband transmission.
1) Width of .eye .opening defines the .interval over .which the .received wave can be sampled without error from ISI.
2.) The sensitivity of the system to timing error is determined by the rate of closure of the eye as the sampling time is varied.
3) Height of the eye opening at sampling time is called margin over noise.

9. How is eye pattern obtained on the CRO?
Eye pattern can be obtained on CRO by applying the signal to one of the input channels and given an external trigger of 1/T*b* Hz. This makes one sweep of beam equal to T*b* seconds.

10. Why do you need adaptive equalization in a switched telephone network.
In switched telephone network the distortion depends upon
1) Transmission characteristics of individual links.
2) Number of links in connection.
Hence fixed pair of transmit and receive filters will not serve the equalization problem. The transmission characteristics keep on changing. Therefore adaptive equalization is used.

11. What are the necessity of adaptive equalization?
Most of the channels are made up of individual links in switched telephone network,the distortion induced depends upon
1) transmission characteristics of individual links
2) number of links in connection

12. Define the principle of adaptive equalization?
The filters adapt themselves to the dispersive effects of the channel that is .the .cofficients of the filters are changed contineously according to the

received data .The filter cofficients are changed in such a way that the distortion in the data is reduced.

13. Define the term ISI?
Ans. The presence of outputs due to other bits interference with the output of required bit . This effect is called inter symbol interference (ISI).

14. Write the performance of data transmission system using eye pattern technique?
The width of the eye opening defines .the interval over which the received wave can can be .sampled without error from inter symbol interference .
The sensitivity of the system to timing error is determined by the rate of closure of the eye as the sampling time is varied.

15.What is the necessity of equalization?
When the signal is passed through the channel distortion is introduced in terms of 1) amplitude 2) delay this distortion creates problem of ISI. The detection of the signal also become difficult this distraction can be compensated with the help of equalizer.

16.What is raised cosine spectrum?
In the raised cosine spectrum, the frequency response P(f) decreases towards zero gradually That is there is no abrupt transition.

17. What is nyquist Bandwidth?
The B.is called nyquist bandwidth. .The nyquist bandwidth is the minimum transmission bandwidth for zero ISI.

18. Give two applications for Eye pattern. **[AUC APR/MAY 2011]**. **[AUC NOV/DEC 2012]**

- To determine an interval over which the received wave van be sampled without error due ot ISI.
- To determine the sensitivity of the system to timing error
- The margin over the noise is determined from eye pattern

19. What are the information that can be obtained from eye pattern regarding the signal quality? **[AUC APR/MAY 2012]**

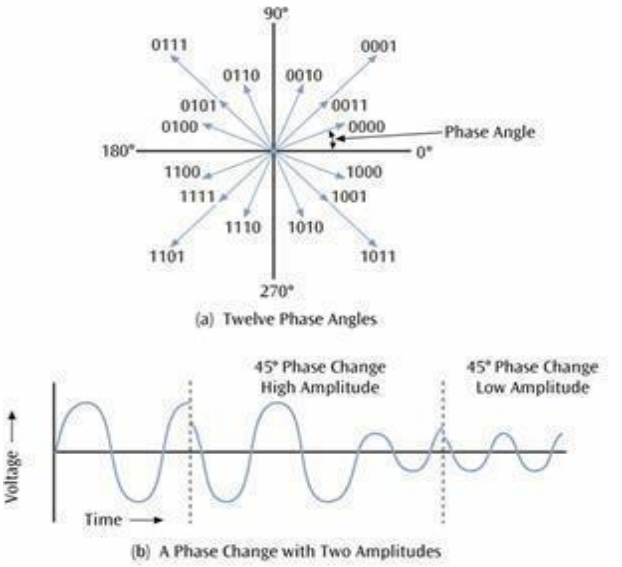
- To determine an interval over which the received wave van be sampled without
- error due ot ISI.
- To determine the sensitivity of the system to timing error
- The margin over the noise is determined from eye pattern

20. A 64 kbps binary PCM polar NRZ signal is passed through a communication system with a raised-cosine filter with roll-off factor 0.25. Find the bandwidth of a filtered PCM signal. **[AUC NOV/DEC 2012]**

Fb=64lpbs
B0=FB/2=32kpbs
α=0.25
B=B0(1+α)=30*10^3(1+0.25)=40kHz

UNIT-IV DIGITAL MODULATION SCHEME

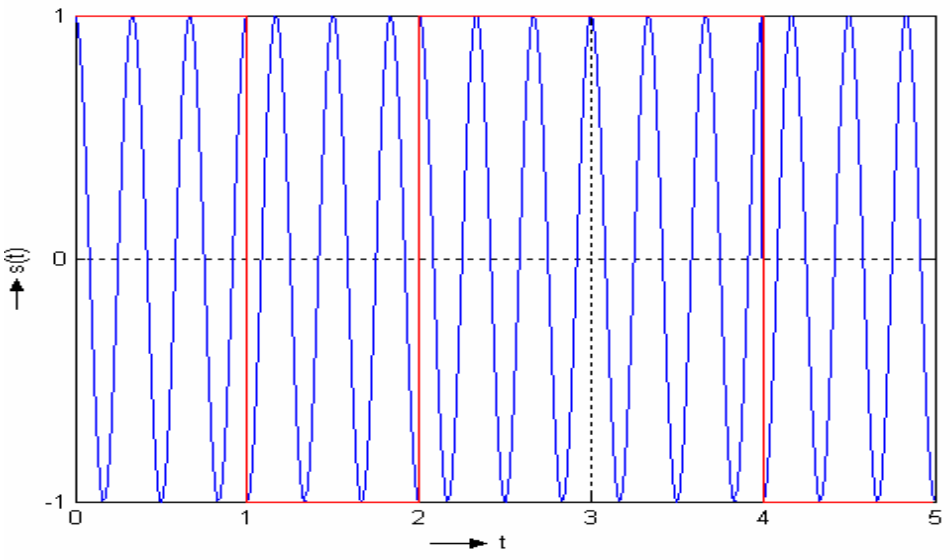
1.Define QAM and draw its constellation diagram. ? **[AUC NOV/DEC 2010]**



2. A binary frequency shift keying system employs two signaling frequencies 1f and 2f. The lower frequency 1f is 1200 Hz and signaling rate is 500 Baud. Calculate 2f. ? **[AUC NOV/DEC 2010]**

For binary FSK baud=fb
Fb=500Hz
Consider the FN modulation index(h) of 1 in FSK
Fm-fs/Fb =h=1
Fm-fs=fb
Fs=f1=1200HZ
Fm-1200Hz=500Hz
Fm=1700Hz,f2=fm=1700Hz.

3. Draw the PSK waveform for 011011. **[AUC APR/MAY 2011]**



4. What is meant by coherent detection system? **[AUC APR/MAY 2011]**
In coherent ASK, correlation receiver is used to detect the signal. Locally generated carrier is correlated with incoming Ask signal. The locally generated carrier is in exact phase either transmitted carrier. Coherent Ask is also called synchronous ASK.

5. Why is PSK always preferable over ASK in coherent detection? **[AUC NOV/DEC 2011]**
ASK is on-off signaling where as the modulated carrier is continuously transmitted in PSK. Hence peak power requirement is more in ASK, where it is reduces in PSK.

6. Differentiate between coherent and non-coherent detection **[AUC NOV/DEC 2011]**
[AUC APR/MAY 2012]
In coherent detection the local carrier generated at the receiver is phase locked with the carrier at the transmitter. Hence it is also called synchronous detection. In non coherent detection the local carrier generated at the receiver not be phase locked with the carrier at the transmitter. It is simple, but it has higher probability of error.

7. What are the drawbacks of binary PSK system? **[AUC APR/MAY 2012]**
It is difficult to detect +b(t) and –b(t) because of squaring in the receiver
Problem, of ISI and inter channel interference are present.

8. A BPSK system makes errors at the average rate of 1000 errors per delay. Data rate is 1 kbps . The single-sided noise power spectral density is 10-20 W/Hz. Assuming the system to be wide sense stationary, what is the average bit error probability?
[AUC NOV/DEC 2012]

24*60*60=86400sec
$86.4*10^{6}$
Bir error probability $Pe=100/86.4*10^{6}$
$=1.1157*10^{-6}$

9. What is meant by DPSK?
In DPSK, the input sequence is modified. Let input sequence be d(t) and output Sequence be b(t). Sequence b(t) changes level at the beginning of each interval in which d(t)=1 and it does not changes level when d(t)=0.
When b(t) changes level, phase of the carrier is changed. And as stated above, b(t) changes t=its level only when d(t) =1. This means phase of the carrier is changed only if d(t)=1. Hence the technique is called Differential PSK.

10. Explain coherent detection?
In coherent detection, the local carrier generated at the receiver is phase locked with the carrier at the transmitter. The detection is done by correlating received noisy signal and locally generated carrier. The coherent detection is a synchronous detection.

11. Bring out the difference between coherent & non coherent binary modulation scheme.
a. Coherent detection:
In this method the local carrier generated at the receiver is phase locked with the carrier At the transmitter. Hence it is called synchronous detection
b. Non coherent detection:
In this method, the receiver carrier need not be phase locked with transmitter carrier. Hence it is called envelope detection.

12. Write the expression for bit error rate for coherent binary FSK.

Bit error rate for coherent binary FSK is given as,

$Pe = 1/2erfc\sqrt{0.6E/No}$

13. What is Signal constellation diagram?

Suppose that in each time slot of duration T seconds, one $s_2(t), \ldots s_M(t)$ is transmitted with equal probability, 1/M For geometric representation, the signal $s_i(t)$, i = 1, 2, ..., M, is applied to a bank of correlators. The correlator outputs define the signal vector si. The set of message points corresponding to the set of transmitted signals $\{s_i(t))\}$ i=1..M is called a signal constellation.

14. What is meant by memory less modulations? **[AUC NOV/DEC 2012]**

When the digital symbol modulates amplitude, phase or frequency of the carrier without any reference to previous symbol, it is called memory less modulations. Eg.:ASK,PSK,FSK,QPSK etc.

15. Define QPSK.

- In QPSK two successive bits in the data sequence are grouped together.This combination of two bits forms four distinct symbols.When the symbol is changed to next symbol the phase of the carrier is changed by 45^0(or $\pi/4$).
- Because of combination of two bits there will be four symbols.Hence the phase shift will be $\pi/4$, $3\pi/4$, $5\pi/4$ or $7\pi/4$.
  QPSK reduces amplitude variations and required transmission bandwidth.

UNIT-V ERROR CONTROL CODING

PART-A

1. Mention is the properties of cyclic codes [AUC NOV/DEC 2011]

Linearity property

The sum of any two code word is also a valid code word

Cyclic property

Every cyclic shift of a valid code vector produces another valid code vector.

2. Define hamming distance. [AUC APR/MAY 2011]

The hamming distance between two code vectors is equal to the number of elements in which they differ. For example, let the two code words be,
X = (101) and Y= (110) These two code words differ in second and third bits. Therefore the hamming distance between X and Y is two.

3. What is meant by transparency with respect to line codes [AUC APR/MAY 2011]

The line code is said to be transparent if the synchronization between the transmitter and receiver is maintained for any type of input data sequence.

4. Define hamming distance and calculate its value for two code words 11100 and 11011 **[AUC APR/MAY 2010]**

The hamming distance between two code vectors is equal to the number of elements in which they differ. For example, let the two code words be,
X = (11100) and Y= (11011)

D= 2 These two code words differ in second and third bits. Therefore the hamming distance between X and Y is two.

5. What is convolution code? How is it different from block codes? [AUC APR/MAY 2012]

Fixed number of input bits is stored in the shift register & they are combined with the help of mod 2 adders. This operation is equivalent to binary convolution coding.

6. State any four desirable properties of line code[AUC NOV/DEC 2012]

- The PAM signal should have adequate timing content,
- The PAM signal should immune to channel noise and interference
- The PAM signal should allow error detection and error correction
- The PAM signal should be transparent to digital data being transmitted

7. Find the hamming distance 101010 and 010101.If the minimum hamming distance of a (n,k) linear block code is 3, what is its minimum hamming weight? [AUC NOV/DEC 2012]

$d(x_1,x_2)=x_1$ exor x_2

=111111

$d(x_1,x_2)=6$

Dmin=3 then Wmin=dmin=3

8. What is meant by syndrome of linear block code?

The non zero output of the produce YHT is called syndrome & it is used to detect errors in y. Syndrome is denoted by S & given as,

S=YHT

9. What is convolutional code? Explain the fundamental difference between block codes and convolutional codes.

Block codes takes"k" number of bits simultaneously form „n"-bit code vector. This code vector is also called block. Convolutional code takes one message bits at a time and generates two or more encoded bits. Thus convolutional codes generate a string of encoded bits for input message string.

10. What is hamming distance?

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X = (101) and Y= (110)

These .two code words differ in second and third bits.Therefore .the .hamming distance between X and Y is two.

11. Define code efficiency**.**

The code efficiency is the ratio of message bits in a block to the transmitted bits for that block by the encoder i.e.,

Code efficiency= (k/n)

k=message bits

n=transmitted bits.

12. What are the error detection and correction capabilities of hamming codes ?

The minimum distance (dmin) of hamming codes is „3". .Hence it can be used to detect double errors or correct single errors. Hamming codes are basically linear block codes with dmin =3.

13. What is meant by linear code?

A code is linear if modulo-2 sum of any two code vectors produces another code vector. This means any code vector can be expressed as linear combination of other code vectors.

14. What is meant by cyclic codes?

Cyclic codes are the subclasses of linear block codes. They have the property that a cyclic shift of one codeword produces another code word.

15. How syndrome is calculated in Hamming codes and cyclic codes?

In hamming codes the syndrome is calculated as,

$S=YH^T$

Here Y is the received and H.is the transpose of parity check matrix

16. What is difference between block codes and convolutional codes**?**

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Quantization:

The conversion of analog sample of the signal into digital form is called quantizing process.

Aliasing effect:

Aliasing effect takes place when sampling frequency is less than Nyquist rate.Under such condition, the spectrum of the sampled signal overlaps with itself.Hence higher frequencies take the form of lower frequencies. This interference of the frequency components is called aliasing effects.

Sampling theorem:

A band limited signal of finite energy, which has no frequency components higher than W Hz, may be completely recovered from the knowledge of its samples taken at the rate of 2W samples per second.

Quantization error:

Because of quantization inherent error are introduces in the signal. The error is called Quantization error Є=xq(nTs)-x(nTs)
xq(nTs)- quantis ed value of the signal
x(nTs)- value of te sample before quantization

Non-uniform quantization:

In non-uniform quantization, the step size is not fixed. It varies according to certain level of input signal amplitude. Step size is small at low input signal levels and the step size is higher at high input levels. Hence signal to noise power ratio remains almost same throughout the input signal.

Compander:

The non-uniform quantization(variable stepsize „∂“)becomes very difficult to implement. Therefore the signal is amplified at low signal levels and attenuated high signal levels.After this process,uniform quantization is used.This is equivalent to more stepsize at low signal levels and small step size at high signal levels.At the receiver a reverse process is done.That is the signal is attenuated at low signal levels and amplified at high signal levels to get original signal.Thus the compressionbof signal at transmitter and expansion at receiver is called combinely as Companding.

Quantization noise power:

Quantisation noise power is the noise power due to quantisation noise. Let the quantisation noise has the pdf of f€(€).Then Quantisation noise power is given as,
$E[€]^2 = €^2\ f_€(€)\ d\ €$.

UNIT-II WAVEFORM CODING

Temporal waveform coding

The singal which varying with time can be digitzed by periodic time sampling and amplitude quantization.this process is called temporal waveform coding .DM,ADM,DPCM are example of temporal waveform coding.

Model based coding

The signal is characterised in various parameter. This parameter represent the model of the signal.LPC is an example model based coding.

DPSK

In DPSK, the input sequence is modified. Let input sequence be d(t) and output sequence be b(t). Sequence b(t) changes level at the beginning of each interval in which d(t)=1 and it does not changes level when d(t)=0.

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DPCM

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In adaptive delta modulation, the step size is adjusted as per the slope of the input signal. Step size is made high if slope of the input signal is high. This avoids slope overload distortion.

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It occurs due to large step size and very small amplitude variation in the input signal.

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In adaptive coding, the quantization step size and prediction filter coefficients are changed as per properties of input signal. This reduces the quantization error and number of bits to represent the sample value. Adaptive coding is used for speech coding at low bits rates.

Adaptive quantizer

Adaptive quantizer changes its step size according variance of .the .input signal. Hence quantization error is significantly reduced due to the adaptive quantization. ADPCM uses adaptive quantization. The bit rate of such schemes is reduced due to adaptive quantization.

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Line codes:

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Properties of line code:

The PAM signal should have adequate timing content,
The PAM signal should immune to channel noise and interference

The PAM signal should allow error detection and error correction
The PAM signal should be transparent to digital data being transmitted.

Intersymbol interference:

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correlative coding:

Correlative level coding is used to transmit a baseband signal with the signalling rate of 2Bo over the channel of bandwidth Bo. This is made physically possible by allowing ISI in the transmitted in controlled manner. This ISI is known to receiver. .The .correlative .coding .is .implemented .by .duobinary .signalling .and modified duobinary signalling.

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The word „duo" means to double the transmission capacity of the binary system.
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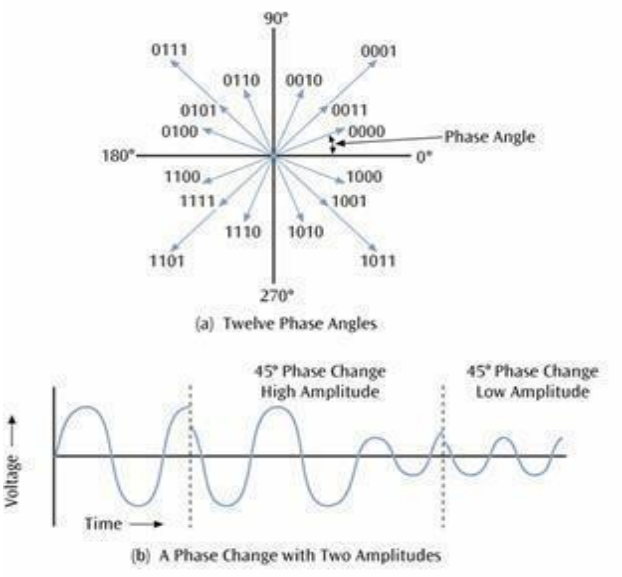
Applications for Eye pattern.

- To determine an interval over which the received wave van be sampled without error due ot ISI.
- To determine the sensitivity of the system to timing error
- The margin over the noise is determined from eye pattern.

UNIT-IV DIGITAL MODULATION SCHEME

QAM :

QAM is a combination of ASK and PSK



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Bit error rate for coherent binary FSK.

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When the digital symbol modulates amplitude, phase or frequency of the carrier without any reference to previous symbol, it is called memory less modulations. Eg.:ASK,PSK,FSK,QPSK etc.

QPSK.

- In QPSK two successive bits in the data sequence are grouped together.This combination of two bits forms four distinct symbols.When the symbol is changed to next symbol the phase of the carrier is changed by 45^0(or $\pi/4$).
- Because of combination of two bits there will be four symbols.Hence the phase shift will be $\pi/4$, $3\pi/4$, $5\pi/4$ or $7\pi/4$.
  QPSK reduces amplitude variations and required transmission bandwidth.

UNIT-V ERROR CONTROL CODING

Properties of cyclic codes:

Linearity property

The sum of any two code word is also a valid code word

Cyclic property

Every cyclic shift of a valid code vector produces another valid code vector.

Hamming distance.

The hamming distance between two code vectors is equal to the number of elements in which they differ. For example, let the two code words be,
X = (101) and Y= (110) These two code words differ in second and third bits. Therefore the hamming distance between X and Y is two.

Transparency with respect to line codes:

The line code is said to be transparent if the synchronization between the transmitter and receiver is maintained for any type of input data sequence.

Hamming distance:

The hamming distance between two code vectors is equal to the number of elements in which they differ. For example, let the two code words be,
X = (11100) and Y= (11011)
D= 2 These two code words differ in second and third bits. Therefore the hamming distance between X and Y is two.

Convolution code:

Fixed number of input bits is stored in the shift register & they are combined with the help of mod 2 adders. This operation is equivalent to binary convolution coding.

Properties of line code:

- The PAM signal should have adequate timing content,
- The PAM signal should immune to channel noise and interference
- The PAM signal should allow error detection and error correction
- The PAM signal should be transparent to digital data being transmitted

Syndrome of linear block code:

The non zero output of the produce YHT is called syndrome & it is used to detect errors in y. Syndrome is denoted by S & given as,

S=YHT.

Convolutional code:

Block codes takes"k" number of bits simultaneously form "n"-bit code vector. This code vector is also called block. Convolutional code takes one message bits at a time and generates two or more encoded bits. Thus convolutional codes generate a string of encoded bits for input message string.

Code efficiency:

The code efficiency is the ratio of message bits in a block to the transmitted bits for that block by the encoder i.e.,
Code efficiency= (k/n)
k=message bits
n=transmitted bits.

Error detection and correction capabilities of hamming codes:

The minimum distance (dmin) of hamming codes is „3". .Hence it can be used to

detect double errors or correct single errors. Hamming codes are basically linear block codes with dmin =3.

Linear code:

A code is linear if modulo-2 sum of any two code vectors produces another code vector. This means any code vector can be expressed as linear combination of other code vectors.

Cyclic codes:

Cyclic codes are the subclasses of linear block codes. They have the property that a cyclic shift of one codeword produces another code word.

syndrome is calculated in Hamming codes and cyclic codes:

In hamming codes the syndrome is calculated as,

$S=YH^T$

Here Y is the received and H.is the transpose of parity check matrix

Block codes and convolutional codes:

Block codes takes "k" .number of bits simultaneously form "n"-bit .code vector. This code vector is also called block. Convolutional code takes one message bits at a time and generates two or more encoded bits. Thus convolutional codes generate a string of encoded bits for input message string.

CARE COLLEGE OF ENGINEERING

DEPARTMENT OF ECE

Subject	**:**	**EC8501 – DIGITAL COMMUNICATION**
Year /Semester	**:**	**III / V**
Academic Year	**:**	**2021-22 (ODD SEMESTER)**

QUESTION BANK

EC8501 – DIGITAL COMMUNICATION

UNIT I – INFORMATION THEORY

Discrete Memory less source, Information, Entropy, Mutual Information - Discrete Memory less channels – Binary Symmetric Channel, Channel Capacity - Hartley - Shannon law - Source coding theorem - Shannon - Fano& Huffman codes.

PART A

Q.No	Questions	BT Level	Competence
1.	Define entropy and give its mathematical equation.	**BTL 1**	**Remembering**
2.	Define source coding. State the significance of source coding.	**BTL 1**	**Remembering**
3.	Recall about BSC.	**BTL 1**	**Remembering**
4.	Define is Huffman code called as minimum redundancy code?	**BTL 2**	**Understanding**
5.	An event has six possible outcomes with probabilities {1/2, 1/4, 1/8, 1/16, 1/32, 1/32}. Solve for the entropy of the system.	**BTL 3**	**Applying**
6.	Outline the concept of discrete memory less source.	**BTL 1**	**Remembering**
7.	Calculate the amount of information if $p_k = 1/4$.	**BTL 3**	**Applying**
8.	Identify the properties of entropy.	**BTL 1**	**Remembering**
9.	Describe information rate.	**BTL 2**	**Understanding**
10.	Illustrate the theory of mutual information.	**BTL 3**	**Applying**
11.	Compose the concept of discrete memory less channel.	**BTL2**	**Understanding**
12.	List out the properties of mutual information.	**BTL 3**	**Applying**
13.	Discuss the Channel coding theorem for discrete memoryless channel.	**BTL 3**	**Applying**
14.	State the properties of mutual information.	**BTL 1**	**Remembering**
15.	Examine the types of discrete memory less channel.	**BTL 3**	**Applying**
16.	Give the main idea of channel capacity.	**BTL 2**	**Understanding**
17.	Summarize Shannon's law	**BTL 2**	**Understanding**

18.	List the steps involved in Shannon fano coding.	**BTL 3**	**Applying**
19.	Distinguish the various source coding techniques.	**BTL 2**	**Understanding**
20.	Revise the steps involved in Huffman coding.	**BTL 1**	**Remembering**

	PART –B			
1.	(i)Illustrate on measure of information and its properties. (ii)Find out the amount of information if binary digits occur with equal likelihood in binary PCM.	**(7)** **(6)**	**BTL 1**	**Remembering**
2.	A source emits one of four symbols S1,S2,S3 and S4 with probabilities {1/3, 1/6, 1/4, 1/4}. Calculate entropy, average code word length and coding efficiency using Huffman coding.	**(10)**	**BTL 2**	**Understanding**
3.	Illustrate the following with equations (i) Average Information (ii) Properties of Entropy (iii)Calculate entropy when P_k= 0 and when P_k=1.	**(5)** **(4)** **(4)**	**BTL 3**	**Applying**
4.	Analyze on Information rate R of an analog signal which is bandlimted to B Hz and sampled at Nyquist rate. The samples are quantized in to 4 levels. Each level represents one message for which the probabilities of occurrence of these 4 messages are given as P_1=P_4=1/8, P_2=P_3=3/8.	**(13)**	**BTL 3**	**Applying**
5.	Four symbols of the alphabet of discrete memory less source and their probabilities are given as {S_1,S_2,S_3,S_4) and {1/3, 1/6, 1/4, 1/4}. Point out the symbols using Shannon fano coding and calculate the average code word length and efficiency.	**(13)**	**BTL 3**	**Applying**
6.	Summarize Shannon's first theorem on Source Coding and deduce the equations for average number of bits, coding efficiency and redundancy.	**(13)**	**BTL 3**	**Applying**
7.	(i)Give the main idea of discrete memoryless channel and its matrix form involving transition probabilities. (ii)Relate the concept of Binary symmetric channel with Binary communication channel.	**(7)** **(6)**	**BTL 2**	**Understanding**
8.	Illustrate the following (i)Mutual information and its properties. (ii)Channel capacity and its equation.	**(7)** **(6)**	**BTL 3**	**Applying**
9.	The DMS has five symbols and their probabilities are {0.4,0.2,0.1,0.2and 0.1}. Construct the symbols using Huffman coding and calculate the average codeword length and efficiency.	**(13)**	**BTL 3**	**Applying**
10.	(i) Brief on discrete communication channels in matrix form. (ii) Describe when Binary Communication Channel becomes BSC.	**(7)** **(6)**	**BTL 1**	**Remembering**
11.	Five symbols of the alphabet of discrete memory less source and their probabilities are given as{S1,S2,S3,S4,S5) and {0.4,0.19,0.16,0.15,0.15}. Construct using Shannon fano Coding and calculate the code efficiency.	**(13)**	**BTL 1**	**Remembering**
12.	A voice grade telephone channel has a bandwidth of 3400 Hz. (i)Predict channel capacity of the telephone channel for a SNR of 30 dB.	**(7)** **(6)**	**BTL 2**	**Understanding**

	(ii)Estimate minimum SNR required to support a rate of 4.8 kbps.			
13.	Reproduce Shannon's all the three laws that govern the Information theory.	**(13)**	**BTL 1**	**Remembering**
14.	A black and white TV picture consists of about 2×10^6 picture elements	**(13)**	**BTL 3**	**Applying**
	with 16 different brightness levels, with equal probabilities. If pictures are repeated at the rate of 32 per second, calculate average rate of information conveyed by this TV picture source. If SNR is 30dB, Analyze the minimum bandwidth required to support the transmission of the resultant video signal.			

	PART – C			
1	The source of information A generates the symbols {A1,A2,A3,A4,A5,A6} with the corresponding probabilities {0.2,0.3,0.11, 0.16,0.18,0.05}. Explain the code for source symbols using Huffman and Shannon-fano encoder and compare its efficiency.	**(15)**	**BTL 3**	**Applying**
2	(i)Explain Shannon's theorem on source coding with need, average no of bits, code efficiency, redundancy and variance. (ii)Find out the average number of bits per symbol for the code words 10,11,010,011,000 and 001.	**(8)** **(7)**	**BTL 3**	**Applying**
3	Discuss various data compaction entropy coding algorithms and detailon the differences between them.	**(15)**	**BTL 3**	**Applying**
4	Five sources messages are probable to appears as symbols {m1,m2,m3,m4,m5) with the corresponding probabilities {0.4, 0.15, 0.15, 0.15 , 0.15}. Discuss the code for source symbols using Huffman and Shannon-fano encoder and compare its efficiency.	**(15)**	**BTL 3**	**Applying**

UNIT II - WAVEFORM CODING & REPRESENTATION

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear Predictive Coding- Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ – Manchester

PART A

Q.No	Questions	BT Level	Competence
1.	What is linear predictor? On what basis are predictor coefficients are determined.	**BTL 1**	**Remembering**
2.	Identify the need of prediction filtering.	**BTL 1**	**Remembering**
3.	List the 2 properties of linear prediction.	**BTL 1**	**Remembering**
4.	Summarize the need of Line Codes.	**BTL 2**	**Understanding**
5.	Why Delta Modulation is superior to differential pulse code modulation?	**BTL 1**	**Remembering**
6.	Express the data 10011 using the Manchester code format.	**BTL 2**	**Understanding**
7.	Discuss about delta modulation and its limitations.	**BTL 2**	**Understanding**
8.	Describe the techniques to overcome slope overload and granular noise in delta modulation system.	**BTL 2**	**Understanding**
9.	Illustrate the principle of DM and ADM.	**BTL 2**	**Understanding**
10.	Illustrate the difference between DM and ADM.	**BTL 2**	**Understanding**
11.	Point out the slope overload distortion in delta modulation systems.	**BTL 3**	**Applying**
12.	Recall the advantages of delta modulator.	**BTL 1**	**Remembering**
13.	Define the concept of ADPCM.	**BTL 3**	**Applying**
14.	Outline the theory of APB and APF.	**BTL 3**	**Applying**
15.	Show the properties of line coding.	**BTL 3**	**Applying**
16.	Define Manchester coding.	**BTL 1**	**Remembering**
17.	Assess the principle of linear predictive coder.	**BTL 3**	**Applying**
18.	Summarize the applications of LPC.	**BTL 3**	**Applying**
19.	Draw the model of LPC.	**BTL 3**	**Applying**
20.	Construct unipolar and RZ code for the binary data 01101001.	**BTL 3**	**Applying**

	PART –B			
1.	(i) Discuss in detail speech generation model. (ii) Assess the process of LPC encoder and decoder.	**(7)** **(6)**	**BTL 3**	**Applying**
2.	State in your own words the functioning of ADPCM system with block diagram.	**(13)**	**BTL 2**	**Understanding**
3.	Describe delta modulation transmitter and receiver with their block diagram.	**(13)**	**BTL 1**	**Remembering**
4.	Illustrate delta modulation principle with waveforms and two forms of error in delta modulation.	**(13)**	**BTL 1**	**Remembering**
5.	Construct a DPCM system transmitter and receiver. Derive the expression for signal to noise ratio of the system.	**(13)**	**BTL 3**	**Applying**
6.	(i) Explain ADM with Transmitter and Receiver block diagram. (ii) Summarize the advantages of adaptive delta modulation.	**(7)** **(6)**	**BTL 2**	**Understanding**
7.	Compare different source coding methods with respect to various parameters of a modulations.	**(13)**	**BTL 3**	**Applying**
8.	A signal having bandwidth of 3kHz is to be encoded using 8 bit PCM and DM system. If 10 cycles of signal are digitized, state how many bits will be digitized in each case if sampling frequency is 10 kHz? Also find bandwidth required in each case.	**(13)**	**BTL 3**	**Applying**
9.	Write the comparison of various line coding techniques based on parameter of line coding formats.	**(13)**	**BTL 1**	**Remembering**

10.	Recall the need for line coding of signals. Explain on the power spectral properties of various line coding signals.	**(13)**	**BTL 1**	**Remembering**
11.	Discuss the waveforms of various types of line coding signals with their signal representation equations.	**(13)**	**BTL 3**	**Applying**
12.	For the following bit sequence 1101010011 draw the waveforms for RZ unipolar, NRZ polar, AMI, Manchester, RZ polar and NRZ line coding techniques.	**(13)**	**BTL 2**	**Understanding**
13.	Explain the properties of line codes and explain on the choice of particular line code depending on the type of application.	**(13)**	**BTL 3**	**Applying**
14.	Describe the slope overload distortion which occurs if $A_m > (\delta/2\pi f_m T_s)$ for a sine wave of frequency f_m and amplitude A_m applied to a delta modulator of step size δ, where Ts is the sampling period.	**(13)**	**BTL 3**	**Applying**

	PART-C			
1	A DM system is designed to operate at 3 times the Nyquist rate for a signal with 3 KHz bandwidth. The quantizing step size is 250mV. (i) Determine the maximum amplitude of a 1 KHz input sinusoid for which delta modulator does not show slope overload. (ii) Discuss the post filtered output SNR for the signal.	**(8)** **(7)**	**BTL 3**	**Applying**
2	In a single integration DM scheme the voice signal is sampled at a rate of 64 kHz, the maximum signal amplitude is 1 volt, voice signal bandwidth is 3.5 kHz. (i) Relate the minimum value of step size to avoid slope overload (ii) Discuss the granular noise $N_{o.}$ (iii) Assuming the signal to be sinusoidal, calculate the signal power and signal to noise ratio.	**(5)** **(5)** **(5)**	**BTL 3**	**Applying**
3	A 1 kHz signal of voice channel is sampled at 4kHz using 12 bit PCM and a DM system. If 25 cycles of voice signal are digitized. Solve in each case (i) Signaling rate (ii) Bandwidth required (iii) No of bits required to be transmitted.	**(5)** **(5)** **(5)**	**BTL 3**	**Applying**
4	For the sequence 11001001 develop the waveforms for bipolar NRZ, Split phase Manchester, Polar RZ and AMI. Sketch also their power spectral densities for the same.	**(15)**	**BTL 3**	**Applying**

UNIT III - BASEBAND TRANSMISSION& RECEPTION

ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding –Eyepattern – Receiving Filters- Matched Filter, Correlation receiver, Adaptive Equalization

PART A

Q.No	Questions	BT Level	Competence
1.	Give the practical difficulties of ideal Nyquist channel.	**BTL 2**	**Understanding**
2.	Summarize the raised cosine spectrum.	**BTL 2**	**Understanding**
3.	Define roll off factor.	**BTL 1**	**Remembering**
4.	Describe the full cosine roll off characteristics.	**BTL 2**	**Understanding**
5.	What is meant by ISI in communication system? How it can be minimized?	**BTL 1**	**Remembering**
6.	Show the frequency response of duo binary signal.	**BTL 3**	**Applying**
7.	Point out duo binary system. What are the drawbacks of it?	**BTL 3**	**Applying**
8.	State Nyquist criteria.	**BTL 1**	**Remembering**
9.	Define the nyquist second and third criteria to realize zero ISI.	**BTL 3**	**Applying**
10.	Discuss how pulse shaping reduce ISI.	**BTL 2**	**Understanding**
11.	List four applications of eye pattern.	**BTL 1**	**Remembering**
12.	Examine correlative level coding.	**BTL 3**	**Applying**
13.	Outline the causes for ISI.	**BTL 1**	**Remembering**
14.	Justify the statement ‘ISI cannot be avoided’.	**BTL 3**	**Applying**
15.	Compare the matched filter and correlation receiver.	**BTL 3**	**Applying**
16.	Illustrate Eye pattern with diagram.	**BTL 3**	**Applying**
17.	Define the necessity of Equalization.	**BTL 1**	**Remembering**
18.	Explain the ways the adaptive equalizer can be implemented.	**BTL 3**	**Applying**
19.	Propose the need of adaptive equalization in a switched telephone network.	**BTL3**	**Applying**
20.	Generalize the function of equalization filter.	**BTL 3**	**Applying**

	PART –B			
1.	Explain the modified Duo binary coding technique and its performance by illustrating its frequency and impulse response.		**BTL 1**	**Remembering**
2.	(i) Write the concept of Matched filter receiver. (ii) Describe the principle of signal reception using a correlator type receiver.	**(7)** **(6)**	**BTL 1**	**Remembering**
3.	Derive the formula for output SNR of a matched filter.	**(13)**	**BTL 1**	**Remembering**
4.	Illustrate "raised cosine spectrum". Discuss how does it help to avoid ISI.	**(13)**	**BTL 3**	**Applying**
5.	What is ISI ? List the various methods to remove ISI in s communication system. Also state and prove Nyquist first criterion for Zero ISI.	**(13)**	**BTL 1**	**Remembering**
6.	(i) Summarize the benefits of Nyquist pulse shaping. (ii) Predict the information provided in eye diagram.	**(7)** **(6)**	**BTL 2**	**Understanding**
7.	Discuss how nyquist criterion eliminates interference in the absence of noise for distortion less baseband binary transmission.	**(13)**	**BTL 2**	**Understanding**
8.	(i) Describe the simple duobinary encoder without precoder. (ii) Explain the frequency response of duobinary encoding scheme.	**(7)** **(6)**	**BTL 2**	**Understanding**
9.	(i) Illustrate the pulse shaping method to minimize ISI. (ii) Discuss how eye pattern illustrates the performance of data transmission system with respect to Inter Symbol Interference with neat sketch.	**(7)** **(6)**	**BTL 3**	**Applying**
10.	Explain how ISI occurs in base-band binary data transmission system.	**(13)**	**BTL 3**	**Applying**
11.	Discuss in detail about the M-ary baseband system.	**(13)**	**BTL 3**	**Applying**
12.	Point out the types of adaptive equalizers in detail with neat diagrams.	**(13)**	**BTL 3**	**Applying**
13.	(i) Analyze the differential encoder with neat block diagram. (ii) Identify the merits and demerits of Duo binary signaling.	**(7)** **(6)**	**BTL 3**	**Applying**
14.	Explain the principle of obtaining eye pattern and mark important observations made from the eye pattern.	**(13)**	**BTL 3**	**Applying**

	Part- C			
1.	Describe the realizations of the receiving filters based on the signalcorrelator and matched filter.	**(15)**	**BTL 3**	**Applying**
2.	Discuss in detail about inter symbol interference (ISI) and the nyquist criterion for minimizing ISI. Elaborate the difficulties in implementing it in a practical system.	**(15)**	**BTL 3**	**Applying**
3.	Describe in detail about correlative coding to eliminate ISI.	**(15)**	**BTL 3**	**Applying**
4.	Explain the adaptive equalization techniques with neat diagram.	**(15)**	**BTL 3**	**Applying**

UNIT IV - DIGITAL MODULATION SCHEME

Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers - Principle of DPSK.

PART A

Q.No	Questions	BT Level	Competence
1.	Outline the need for geometric representation of signals.	**BTL 2**	**Understanding**
2.	Draw the block diagram of a coherent BFSK receiver.	**BTL 1**	**Remembering**
3.	Identify the difference between BPSK and QPSK techniques.	**BTL 1**	**Remembering**
4.	What is QPSK? Write down the expression for the QPSK signal.	**BTL 1**	**Remembering**
5.	Sketch the BER curve for ASK,FSK,BPSK digital modulation schemes.	**BTL 1**	**Remembering**
6.	A BFSK system employs two signaling frequencies f1 and f2. The lower frequency f1 is 1200 Hz and signaling rate is 500 Baud. Compute f2.	**BTL 3**	**Applying**
7.	A BPSK system makes errors at the average rate of 100 errors per day. Data rate is 1 kbps. The single-sided noise power spectral density is 10 W/Hz. Assume the system to be wide sense stationary, predict the average bit error probability.	**BTL 3**	**Applying**
8.	Compare coherent and non-coherent reception.	**BTL 3**	**Applying**
9.	Distinguish the error probability for BPSK and QPSK.	**BTL 3**	**Applying**
10.	Discuss the drawbacks of ASK.	**BTL 2**	**Understanding**
11.	Indicate why PSK always preferable over ASK in Coherent detection.	**BTL 2**	**Understanding**
12.	Write the special features of QAM.	**BTL 1**	**Remembering**
13.	Explain the signal space diagram for QAM signal for M=8.	**BTL 1**	**Remembering**
14.	Illustrate about the constellation diagram.	**BTL 2**	**Understanding**
15.	Design a carrier synchronization using M^{th} power loop.	**BTL 3**	**Applying**
16.	Explain the concept of memoryless modulation.	**BTL3**	**Applying**
17.	Identify the difference between coherent and non-coherent digital modulation techniques.	**BTL 3**	**Applying**
18.	Outline the concept of spectral efficiency.	**BTL 3**	**Applying**
19.	Discuss the error probability of DPSK.	**BTL 3**	**Applying**
20.	Discuss the features of DPSK.	**BTL 3**	**Applying**

	PART –B			
1.	(i) What is digital modulation scheme? Derive geometrical representation of signal. (ii) Write about the geometric representation of BPSK signal and BFSK signal.	**(7)** **(6)**	**BTL 1**	**Remembering**
2.	Explain the generation and detection of a coherent binary PSK signal and derive the power spectral density of binary PSK signal and plot it.	**(13)**	**BTL 1**	**Remembering**
3.	Discuss the non-coherent detection of FSK signal and derive the expression for the probability of error.	**(13)**	**BTL 2**	**Understanding**
4.	Discuss the transmitter, receiver and signal space diagram of QPSK and describe how it produces the original sequence with the minimum probability of error with neat sketch .	**(13)**	**BTL 2**	**Understanding**
5.	Summarize the transmitter, receiver and generation of non-coherent version of PSK with neat sketch. derive the power spectral density of binary PSK signal	**(13)**	**BTL 2**	**Understanding**
6.	Outline the generation and detection of a coherent ASK signal and derive the power spectral density of binary ASK signal and plot it.	**(13)**	**BTL 1**	**Remembering**
7.	(i) Outline the BER comparison of coherent PSK, coherent QPSK and coherent FSK. (ii)Show the difference between coherent and non-coherent scheme.	**(7)** **(6)**	**BTL 3**	**Applying**
8.	(i) Illustrate Carrier Synchronization in QPSK. (ii) Calculate the BER for a Binary phase shift keying modulation from first principles.	**(6)** **(7)**	**BTL 3**	**Applying**
9.	(i) List the difference between QAM and QPSK. (ii) Describe QPSK signaling with diagrams.	**(7)** **(6)**	**BTL 1**	**Remembering**
10.	(i) Explain the transmitter, receiver and signal space diagram of Quadrature Amplitude Modulation. (ii) Describe the power spectral density and bandwidth of QAM signal with neat diagrams and mention its advantages.	**(5)** **(8)**	**BTL 3**	**Applying**
11.	(i) Describe the constellation diagram of QPSK scheme. (ii) Identify the error performance of coherent detection QAM system.	**(7)** **(6)**	**BTL 3**	**Applying**
12.	(i) Discuss the Quadrature Receiver structure for coherent QPSK with appropriate diagram. (ii) In a QPSK system, the bit rate of NRZ stream is 10 Mbps and carrier frequency is 1GHz. Tell the symbol rate of transmission and bandwidth requirement of the channel.	**(4)** **(9)**	**BTL 3**	**Applying**
13.	(i) Explain the principle of working of an "early late bit synchronizer". (ii) Develop the expression for bit error probability of QPSK system.	**(8)** **(5)**	**BTL 3**	**Applying**
14.	(i) Identify the principle of DPSK? Explain the transmitter and receiver of DPSK scheme. (ii) Point out the Probability of error for coherently detected BFSK.	**(7)** **(6)**	**BTL 3**	**Applying**

	PART-C			
1	A set of binary data is sent at the rate of R_b= 10(PART) a channel with 60 dB transmission loss and power spectral density 5 Kbps over V/Hz at the receiver. η= 10-12 . Applying the transmitted power for a bit error probability P_e= $10^{-3}$for the following modulation schemes. (a) FSK (b) PSK (c) DPSK (d) 16 QAM	**(15)**	**BTL 3**	**Applying**
2	Draw the signal space diagram of a coherent QPSK modulation scheme and also find the probability of error if the carrier takes on one of four equally spaced values 0^o,90^o, 180^o and 270^o.	**(15)**	**BTL 3**	**Applying**
3	In digital CW communication system, the bit rate of NRZ data stream in 1 Mbps and carrier frequency is 100 MHz. Solve for the symbol rate of transmission and bandwidth requirement of the channel in the following cases of different techniques used. (i) BPSK system (ii) QPSK system (iii) 16-ary PSK system	**(15)**	**BTL 3**	**Applying**
4	(i) Find the error probability of BFSK system for following parameters. PSD of white noise $N_o/2 = 10^{-10}$ Watt/Hz Amplitude of carrier is , A = 1mV at receiver input. Frequency of baseband NRZ signal is f_b=1kHz. (ii) Binary data is transmitted using PSK at rate 2Mbps over RF link having bandwidth 2MHz. Find signal power required at the receiver input so that error probability is less than or equal to 10^{-4} Assume noise PSD to be 10^{-10}Watt/Hz.	**(5)** **(10)**	**BTL 3**	**Applying**

UNIT V - ERROR CONTROL CODING

Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder

PART A

Q.No	Questions	BT Level	Competence
1.	State Channel Coding Theorem and its need.	**BTL 1**	**Remembering**
2.	Analyze the need for error control codes.	**BTL 3**	**Applying**
3.	Outline the features of linear code.	**BTL 1**	**Remembering**
4.	Illustrate the code rate of a block code.	**BTL 2**	**Understanding**
5.	Describe the significance of minimum distance of a block code.	**BTL 3**	**Applying**
6.	Explain the syndrome properties of linear block code.	**BTL 2**	**Understanding**
7.	Distinguish Hamming Distance and Hamming weight.	**BTL 3**	**Applying**
8.	Find the Hamming distance between 101010 and 010101. If the minimum Hamming distance of a (n, k) linear block code is 3, what is the minimum Hamming weight?	**BTL 3**	**Applying**
9.	Summarize the advantages and disadvantages of Hamming codes.	**BTL 2**	**Understanding**
10.	Discuss two properties of generator polynomial.	**BTL 2**	**Understanding**
11.	List the properties of cyclic codes.	**BTL 1**	**Remembering**
12.	Illustrate the systematic code word with its structure.	**BTL 3**	**Applying**
13.	When a binary code does is said to be cyclic codes?	**BTL 1**	**Remembering**
14.	Explain the generator polynomial of a cyclic codes.	**BTL 3**	**Applying**
15.	Generate the cyclic code for (n, k) syndrome calculator.	**BTL 3**	**Applying**
16.	The code vector [1110010] is sent, the received vector is [1100010]. Identify the Syndrome.	**BTL 3**	**Applying**
17.	What is meant by constraint length of a convolutional encoder?	**BTL 1**	**Remembering**
18.	Explain about convolutional code. How is it different from block codes?	**BTL 1**	**Remembering**
19.	Describe how Trellis diagram is used to represent the code generated by convolutional coder and mention its advantages.	**BTL 3**	**Applying**
20.	Determine the various techniques/algorithms used. in encoding and decoding of convolutional code.	**BTL 3**	**Applying**

	PART-B			
1.	Consider the (7,4) linear block code with generator matrix $\begin{bmatrix} 1000:101 \\ 0100:111 \\ 0010:110 \\ 0001:011 \end{bmatrix}$ (i) Find all the code vectors. (ii) Find parity check matrix. (iii) Minimum weight of this code.	**(5)** **(4)** **(4)**	**BTL 1**	**Remembering**
2.	For a systematic (6, 3) linear block code, $P = \begin{bmatrix} 101 \\ 011 \\ 110 \end{bmatrix}$. Analyze all the possible code vectors.	**(13)**	**BTL 3**	**Applying**
3.	(i) Describe the steps involved in the generation of linear block codes. (ii) Explain the properties of syndrome.	**(7)** **(6)**	**BTL 2**	**Understanding**
4.	Illustrate how the errors are corrected using hamming code with an example.	**(13)**	**BTL 2**	**Understanding**
5.	Recall syndrome decoding and explain its property with appropriate example.	**(13)**	**BTL 1**	**Remembering**
6.	Assume that the codeword C=10110 for the (6,3) case is transmitted and the vector R=001110 is received. Show how a decoder using the syndrome lookup table can correct the error. Take generator matrix as $G = \begin{bmatrix} 110100 \\ 011010 \\ 101001 \end{bmatrix}$	**(13)**	**BTL 3**	**Applying**
7.	An error control code has the following parity check matrix $H = \begin{bmatrix} 101100 \\ 110010 \\ 011001 \end{bmatrix}$ (i) What is the generator matrix G? (ii) Find the codeword that begins with 101… (iii) Decode the received codeword 110110. Comment on error correction and detection capability of this code.	**(4)** **(4)** **(5)**	**BTL1**	**Remembering**
8.	Describe the cyclic codes with the linear and cyclic property. Also represent the cyclic property of a code word in polynomial notation.	**(13)**	**BTL 3**	**Applying**
9.	Draw the diagram of the ½ rate convolutional encoder with generator polynomials $G^1(D)=1+D$ $G^2(D)=1+D+D^2$ And complete the encoder output for input sequence 101101.	**(13)**	**BTL 2**	**Understanding**
10.	Find the (7,4) systematic and non-systematic cyclic code words of the message word 1101.Assume the generator polynomial as $1+x^2+x^3$	**(13)**	**BTL 1**	**Remembering**
11.	Determine how Viterbi decoding algorithm is used for convolutional code.	**(13)**	**BTL 3**	**Applying**

12.	Draw the state diagram of rate ½ convolutional encoder given in the figure below.	**(13)**	**BTL 3**	**Applying**
13.	A convolutional code is described by the following generator sequences, $g^{(1)}$= {1,0,1}, $g^{(2)}$= {1,0,0}, $g^{(3)}$= {1,1,1}. (i) Draw the encoder to this code (ii) Draw the state diagram (iii) If the message sequence is 10110, Design the code word.	**(4)** **(5)** **(4)**	**BTL 3**	**Applying**
14.	(i) Compare linear block codes and convolutional codes. (ii) State the advantages, disadvantages and applications of convolutional codes.	**(7)** **(6)**	**BTL 3**	**Applying**

PART – C

1.	For a systematic (6,3) linear block code $G=\begin{bmatrix}1&0&0&1&0&1\\0&1&0&0&1&1\\0&0&1&1&1&0\end{bmatrix}$, (i) Solve for all the code vectors (ii) Draw encoder circuit for the above code (iii) Predict minimum hamming weight	**(5)** **(5)** **(5)**	**BTL 3**	**Applying**
2.	For a systematic linear block code, the three parity check digits P_1, P_2,P_3 are given by $P_{k,n-k} = \begin{bmatrix}101\\111\\110\\011\end{bmatrix}$ (i) Construct generated matrix. (ii) Assess the t code generated by the matrix. (iii) Determine error correcting capacity. (iv) Decode the received words with an example.	**(4)** **(4)** **(4)** **(3)**	**BTL 3**	**Applying**
3	Explain about code tree, code trellis and state diagrams. Compare code tree with trellis diagram.	**(10)** **(5)**	**BTL 3**	**Applying**
4	A convolutional code is described by g1=[1 0 0], g2=[1 1 1], g3=[1 0 1] (i) Build the encoder corresponding to the code. (ii) Develop the code tree and state diagram for this code. (iii) Draw the trellis diagram.	**(5)** **(5)** **(5)**	**BTL 3**	**Applying**

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COLLEGE OF ENGINEERING
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27, Thayanur, Trichy – 620009

INTERNAL QUALITY ASSURANCE CELL [IQAC]
Course File Auditing Format

Department:	Electronics andCommunication Engineering	Name of the Auditor:	C.Muthukumaran , AP/CSE	Date:	16/08/2021

S.No.	Faculty Name	Course Code	Course Name	Course Information	Lesson Plan	Lecture Noting	Sample PPT	University Question Paper	Question Bank	2 Marks and Answers	Assignment Questions and	CO-PO Attainment Sheet	Course End	University QP Analysis	Attendance/ Assessment
1	Mrs.R.Vanitha	EC8351	Eelctronic Circuits I	No NC	No NC	Some columns are left blank	Uploaded for only one unit	only one QP mapping is completed	No NC	Not available	No NC	NA	NA	NA	Verified
		EC8701	Antenna and Microwave Propagatic	No NC	No NC	Unit 2 content date not entered	Uploaded for only one unit	only one QP mapping is completed	No NC	Not available	No NC	NA	NA	NA	Verified
2	Mrs.K.Rubitha	EC8352	Signals and Systems	No NC	No NC	S.No. 1 and 9 were not filled	Uploaded	Not available	No NC	Not available	Not available	NA	NA	NA	Verified
		EC8553	Discrete-Time Signal Processing	No NC	No NC	S.No. 1 and 9 were not filled	Uploaded	Not available	No NC	Not available	Not available	NA	NA	NA	Verified
3	Mrs.M.Shiva Shank	EC8392	DigitaL Electronics	No NC	No NC	No NC	Uploaded	only one QP mapping is completed	No NC	No NC	No NC	NA	NA	NA	Verified
		EC8501	Digital Communciation	No NC	No NC	No NC	Uploaded	only one QP mapping is completed	No NC	No NC	No NC	NA	NA	NA	Verified
4	Mrs.R.Deepalakshmi	EC8551	Communication Networks	No NC	No NC	No NC	Uploaded	Three sets of QP mapping were done	No NC	Not available	No NC	NA	NA	NA	Verified
		ec8791	Embedded and Real time systems	No NC	No NC	No NC	Uploaded	4 years question paper to be completed	No NC	Not available	No NC	NA	NA	NA	Verified
5	Dr.J.Jeyarani	GE8077	Total Quality Management	No NC	No NC	No NC	Uploaded	Three sets of QP mapping were done	No NC	No NC	No NC	NA	NA	NA	Verified
6	Mr.P.Selvakumar	EC8702	Ad hoc and Wireless Sensor Netwo	Not available	Not available	NC	Uploaded	Not available	Not available	Not available	Not available	NA	NA	NA	Verified
7	Mr.S.Sriram Sundar	EC8751	Optical Communication	No NC	No NC	NC	Uploaded	Not available	Not available	Not available	Not available	NA	NA	NA	Verified
		CS8351	Digital Principles and System Desig	No NC	No NC	NC	Uploaded	Not available	Available Without BT level	Not available	Not available	NA	NA	NA	Verified
8	Mrs.J.Jecintha	EC8395	Communication Engineering	No NC	No NC	Not filled date and micro plan	I	Not available	No NC	Not available	Not available	NA	NA	NA	Verified
9	Ms.J.Vinitha	CS2351	Microprocessors and Microcontroll	No NC	No NC	Completed only one unit	I	No NC	No NC	Not available	Not available	NA	NA	NA	Verified
		ME8791	Mechatronics	No NC	No NC	No NC	Uploaded	No NC	No NC	Not available	Not available	NA	NA	NA	Verified
10	Ms.Y.D.Christina Merline	MA8352	Linear Algebra and Partial Differential Equations	No NC	No NC	No NC	Uploaded	No NC	No NC	No NC	No NC	NA	NA	NA	Verified

*NC- Non Conformance
*I- Need Improvement
*NA- Not Applicable

C. Muthukumaran
Auditor

J. Jeyarani
IQAC Co-ordinator

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COLLEGE OF ENGINEERING

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27, Thayanur, Trichy – 620009

Department of **ECE**

Branch: ECE Year: III Sem: V Batch: 2019-2023

Course Code & Name: EC 8501 DIGITAL COMMUNICATION

Faculty In-charge: M. SHIVA SHANKARI

Assignment – I Questions

1. A source emits one of four symbols S1,S2, S3 and S4 with probabilities {1/3, 1/6, 1/4, 1/4}. Calculate entropy, average code word length and coding efficiency using Huffman coding.
2. Four symbols of the alphabet of discrete memory less source and their probabilities are given as {S_1,S_2,S_3,S_4) and {1/3, 1/6, 1/4, 1/4}. Point out the symbols using Shannon fano coding and calculate the average code word length and efficiency.
3. Five symbols of the alphabet of discrete memory less source and their probabilities are given as{S1,S2,S3,S4,S5) and {0.4,0.19,0.16,0.15,0.15}. Construct using Shannon fano Coding and calculate the code efficiency.
4. The source of information A generates the symbols {A1,A2,A3,A4,A5,A6} with the corresponding probabilities {0.2,0.3,0.11, 0.16,0.18,0.05}. Explain the code for source symbols using Huffman and Shannon-fano encoder and compare its efficiency.
5. Five sources messages are probable to appears as symbols {m1,m2,m3,m4,m5) with the corresponding probabilities {0.4, 0.15, 0.15, 0.15 , 0.15}. Evaluate the code for source symbols using Huffman and Shannon-fano encoder and compare its efficiency.

Faculty

DIGITAL COMMUNICATION

EC8501

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25/25

1. Solution:

Entropy of the Source

Here $P_1 = 1/3$, $P_2 = \frac{1}{6}$, $P_3 = 1/4$ and $P_4 = 1/4$

$$H = \sum_{k=1}^{4} P_k \log_2 P_k$$

$$= -\left[P_1 \log_2 P_1 + P_2 \log_2 + P_3 \log_2 P_3 + P_4 \log_2 P_4\right]$$

$$= -\left[\frac{1}{3}\log_2 3 + \frac{1}{6}\log_2 6 + \frac{1}{4}\log_2 4\right]$$

$$= 1.959 \text{ bits/ symbol.}$$

ii) Huffman coding:

Symbol	Probability	Stage I	Stage II	Stage III	bits obtained	Code word	n_k
S_1	1/3	1/3	5/12	7/12	0	00	2
S_3	1/4	1/3	1/3	5/12	10	01	2
S_4	1/4	1/4	1/3		11	10	2
S_2	1/6	1/4			01	11	2

$$\bar{N} = \sum_{k=1}^{4} P_k n_k = P_1 n_1 + P_2 n_2 + P_3 n_3 + P_4 n_4$$

$$= 1/3 \times 2 + \frac{1}{6} \times 2 + \frac{1}{4} \times 2 + \frac{1}{4} \times 2.$$

$$= 2 \text{ bits / symbol.}$$

$$\eta = H/\bar{N} = \frac{1.959}{2}$$

$$\eta = 0.9795$$

25/25

8107191060002

1) Sol:-

Entropy of the source

$P_1 = 1/3$, $P_2 = 1/6$, $P_3 = 1/4$ and $P_4 = 1/4$

$$H(S) = -\sum_{k=1}^{4} P_k \log_2 P_k$$

$$= -\left[P_1 \log_2 P_1 + P_2 \log_2 P_2 + P_3 \log_2 P_3 + P_4 \log_2 P_4\right]$$

$$= -\left[1/3 \log_2 3 + 1/6 \log_2 6 + 1/4 \log_2 4\right]$$

$$= 1.959 \text{ bits/symbol}$$

Huffman coding :-

Symbol	Probability	I	II	III	Bits obtained by tracing	code word	D_k
S_1	1/3	5/12	7/12		0 0	00	2
S_3	1/4	1/3	5/12		0 1	01	2
S_4	1/4	1/4			1 0	10	2
S_2	1/6				1 1	11	2

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Winner

Page:
Date: / /

25/25

1. Sol:

Entropy of the source

Here $P_1 = 1/3$, $P_2 = 1/6$, $P_3 = 1/4$ and $P_4 = 1/4$

$$H = -\sum_{k=1}^{4} P_k \log_2 P_k$$

$$= -[P_1 \log_2 P_1 + P_2 \log_2 P_2 + P_3 \log_2 P_3 + P_4 \log_2 P_4]$$

$$= -\left[\frac{1}{3}\log_2 3 + \frac{1}{6}\log_2 6 + \frac{1}{4}\log_2 4\right]$$

$$= 1.959 \text{ bits/symbol}$$

b) Huffman Coding:

Symbol	Probability	Stage I	Stage II	Stage III	Bits obtained by tracing	Code Word	n_k
S_1	1/3	1/3 →	5/12 →	7/12 →	0 0 0	0 0	2
S_3	1/4	1/3 →	1/3 →	5/12 →	1 0	0 1	2
S_4	1/4 →	1/4 →	1/3 →		0 1	1 0	2
S_2	1/6 →				1 1	1 1	2

$$\bar{N} = \sum_{k=1}^{4} P_k n_k = P_1 n_1 + P_2 n_2 + P_3 n_3 + P_4 n_4$$

$$= \frac{1}{3}\times 2 + \frac{1}{6}\times 2 + \frac{1}{4}\times 2 + \frac{1}{4}\times 2$$

$$= 2 \text{ bits/Symbol}$$

$$\eta = H/\bar{N} = 1.959/2 = 0.9795$$

Roll Number							

CARE COLLEGE OF ENGINEERING, TRICHY

DEPARTMENT OF ECE

CLASS:	**:**	**III B.E ECE**	**MAX MARKS**	**:**	**40**
SEMESTER:	**:**	**V**	**DURATION**	**:**	**45 mins**
SUBJECT:	**:**	**DIGITAL COMMUNICATION**	**CODE**	**:**	**EC8501**
COURSE NO	:	**C501**	**DATE**	**:**	**7.9.2021/FN**
ACADEMIC YEAR	:	**2021 – 22 (ODD)**	**EXAM**	**:**	**Unit Test-1**

PART – A (6 X 2 = 12 Marks)				
I	**ANSWER ALL QUESTIONS**		**BT level**	**CO**
	1.	Explain the need for channel coding	K1	C501.1
	2.	State the properties of mutual information.	K2	C501.1
	3.	Compose the concept of discrete memory less channel.	K2	C501.1
	4.	An event has six possible outcomes with probabilities{1/2,1/4,1/8,1/16,1/32, 1/32}. Solve for the entropy of the system.	K3	C501.1
	5.	List the steps involved in Shannon fano coding.	K1	C501.1
	6.	Define coding efficiency	K1	C501.1

PART – B (1 X 13 = 13 Marks)							
II	**ANSWER ALL QUESTIONS**				Marks	**BT Level**	**CO**
	07.	(a)		A source emits one of four symbols X1,X2,X3,X4,X5,X6 with probabilities (0.2,0.3,011,0.16,0.18,0.05).Calculate entropy, average code word length and coding efficiency using Huffman coding and Shannon fano coding.	13	K3	C501.4
(OR)							
		(b)		Brief on discrete communication channels in matrix form and explain mutual information , channel capacity and its equation	14	K2	C501.1
III	**ANSWER ALL QUESTIONS**				Marks	**BT Level**	**CO**
PART – C (5 X 1 = 5 Marks)							
	08 to 12			Multiple Choice Questions https://forms.gle/dJC5U5uENJfSPkke9	5		
Part – D (5 x 2 = 10 Marks)							
	13 to 17			Multiple Choice Questions https://forms.gle/dJC5U5uENJfSPkke9	10		

Blooms Levels: K1 - Remember, K2 – Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 – Create

M.Shiva Shankari AP/ECE **Dr.J.Jeyarani** **Dr.S.Shanthi**

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INTERNAL QUALITY ASSURANCE CELL [IQAC]

Question Paper Audit Format

Department:ECE | Auditor :M.SHIVA SHANKARI

S.No.	Faculty Name	Course Code	Course Name	UT (I-II) / CT (I-II) / Model	Part-A (BTL)	Part-B (BTL)	Part-C (BTL)	MCQ (BTL)	Assignment (BTL)	Seminar/ other Activities (BTL)	Status	REMARKS
1	Ms.R.Deepalakshmi	EC8791	Embedded and Real Time Systems	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include same BT level for the choices in Part-B Questions
2	Ms.R.Vanitha	EC8701	Antennas and Microwave Engineering	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include BT Level only with low levels k1,k2,k3
3	Mr.S.Sriram Sundar	EC8751	Optical Communication	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include BT Level only with low levels k1,k2,k3
4	Dr.J.Jeyarani	EC8702	Ad hoc and Wireless Sensor Networks	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include BT Level only with low levels k1,k2,k3
5	Ms.M.Shivashankari	EC8501	Digital Communication	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include BT Level only with low levels k1,k2,k3
6	Ms.K.Rubitha	EC8553	Discrete-Time Signal Processing	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include BT Level only with low levels k1,k2,k3

7	Ms.J.Jecintha	EC8552	Computer Architecture and Organization	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include BT Level only with low levels k1,k2,k3
8	Ms.R.Deepalakshmi	EC8551	Communication Networks	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include BT Level only with low levels k1,k2,k3
9	Ms.R.Vanitha	EC8351	Electronic Circuits- I	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include BT Level only with low levels k1,k2,k3
10	Ms.K.Rubitha	EC8352	Signals and Systems	UT I	Available	Available	Available	Available	NA	NA	Uploaded	Include same BT level for the choices in Part-B Questions
11	Ms.M.Shivashankari	EC8392	Digital Electronics	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include BT Level only with low levels k1,k2,k3
12	Ms.J.Vinitha	EC8691	Microprocessors and microcontroller	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include same BT level for the choices in Part-B Questions
13	Ms.J.Vinitha	ME8791	Mechatronics	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include BT Level only with low levels k1,k2,k3
14	Mr.S.Sriram Sundar	CS8351	Digital Principles and system design	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include same BT level for the choices in Part-B Questions
15	Ms.J.Jecintha	EC8395	CommunicationEngineering	UT-I	Available	Available	Available	Available	NA	NA	Uploaded	Include same BT level for the choices in Part-B Questions

*NA- Not Applicable

Auditor

IQAC Co-ordinator

Principal

Roll Number							

CARE COLLEGE OF ENGINEERING, TRICHY

DEPARTMENT OF ECE

CLASS:	**:**	**III B.E ECE**	**MAX MARKS**	**:**	**50**
SEMESTER:	**:**	**V**	**DURATION**	**:**	**1.30 hrs**
SUBJECT:	**:**	**DIGITAL COMMUNICATION**	**CODE**	**:**	**EC8501**
COURSE NO	:	**C501**	**DATE**	**:**	**4.10.21/FN**
ACADEMIC YEAR	:	**2021 – 22 (ODD)**	**EXAM**	**:**	**Cycle Test-1**

PART – A (7 X 2 = 14 Marks)				
I	**ANSWER ALL QUESTIONS**		**BT level**	**CO**
	1.	Give the capacity of the channel having infinite bandwidth	K1	C501.1
	2.	An event has 6 possible outcomes with probabilities **½, ¼,1/8,1/16,1/32**.Find the entropy of the system	K2	C501.1
	3.	Differentiate lossy source coding from lossless coding	K2	C501.1
	4.	List the main difference in DPCM and DM?	K2	C501.2
	5.	What are the 2 types of quantization errors in that occur in DM?	K2	C501.2
	6.	What is the need for prediction filtering?	K1	C501.2
	7.	Draw NRZ and RZ digital data 10110001	K1	C501.2

PART – B (2 X 13 = 26 Marks)							
II	**ANSWER ALL QUESTIONS**				Marks	**BT Level**	**CO**
	08.	(a)		Summarize Shannon's first theorem on Source Coding and deduce the equations for average number of bits, coding efficiency and redundancy	13	K3	C501.1
				(OR)			
		(b)		Eight possible messages p(m1)=0.5, p(m2)= 0.15, p(m3)=0.15, p(m4)=0.08, p(m5)=0.08,p(m6)=0.02, p(m7)=0.01,p(m8)=0.01.Construct Shannon fano coding and find the coding efficiency.	13	K3	C501.1
	09.	(a)		What is the need for line shaping of signals? Derive the PSD of a unipolar RZ and NRZ line code and compare their performance.	13	K3	C501.2
				(OR)			
		(b)		Explain in detail about the Differential Pulse Code Modulation and derive the signal to noise ratio in DPCM	13	K3	C501.2
III	**ANSWER ALL QUESTIONS**				Marks	**BT Level**	**CO**
	PART – C (10 X 1 = 10 Marks)						
	10 to 19			Multiple Choice Questions https://forms.gle/ofJXtZKuYqcrptJ16	10	K2	C501.2

Blooms Levels: K1 - Remember, K2 – Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 – Create

M.Shiva Shankari AP/ECE
Faculty In-charge

Dr.J.Jeyarani
HOD

Dr.S.Shanthi
Principal

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INTERNAL QUALITY ASSURANCE CELL [IQAC]

Question Paper Audit Format

	Department:ECE	Auditor :M.Shiva Shankari/AP/ECE									
S.No.	Faculty Name	Course Code	Course Name	UT (I-II) / CT (I-II) / Model	Part-A (BTL)	Part-B (BTL)	Part-C (BTL)	MCQ (BTL)	Assignment (BTL)	Seminar/other Activities (BTL)	Status
1	Ms.R.Deepalakshmi	EC8791	Embedded and Real Time Systems	CT-I	Available	Available	NA	Available	NA	NA	Uploaded
2	Ms.R.Vanitha	EC8701	Antennas and Microwave Engineering	CT-I	Available	Available	NA	Available	NA	NA	Uploaded
3	Mr.S.Sriram Sundar	EC8751	Optical Communication	CT-I	Available	Available	NA	Available	NA	NA	Uploaded
4	Dr.J.Jeyarani	EC8702	Ad hoc and Wireless Sensor Networks	CT-I	Available	Available	NA	Available	NA	NA	Uploaded
5	Ms.M.Shivashankari	EC8501	Digital Communication	CT-I	Available	Available	NA	Available	NA	NA	Uploaded
6	Ms.K.Rubitha	EC8553	Discrete-Time Signal Processing	CT-I	Available	Available	NA	Available	NA	NA	Uploaded
7	Ms.J.Jecintha	EC8552	Computer Architecture and Organization	CT-I	Available	Available	NA	Available	NA	NA	Uploaded
8	Ms.R.Deepalakshmi	EC8551	Communication Networks	CT-I	Available	Available	NA	Available	NA	NA	Uploaded
9	Ms.J.Vinitha	EC8691	Microprocessors and microcontroller	CT-I	Available	Available	NA	Available	NA	NA	Uploaded
10	Ms.J.Vinitha	ME8791	Mechatronics	CT-I	Available	Available	NA	Available	NA	NA	Uploaded

* NA - Not Applicable

Auditor

J. Jeyarani

IQAC Co-Ordinator

S. Shanthi

Principal

Roll Number							

CARE COLLEGE OF ENGINEERING, TRICHY

DEPARTMENT OF ECE

CLASS:	**:**	**III B.E ECE**	**MAX MARKS**	**:**	**40**
SEMESTER:	**:**	**V**	**DURATION**	**:**	**45 mins**
SUBJECT:	**:**	**DIGITAL COMMUNICATION**	**CODE**	**:**	**EC8501**
COURSE NO	:	**C501**	**DATE**	**:**	**16.10.2021/FN**
ACADEMIC YEAR	:	**2021 – 22 (ODD)**	**EXAM**	**:**	**Unit Test-2**

PART – A (6 X 2 = 12 Marks)				
I	**ANSWER ALL QUESTIONS**		**BT level**	**CO**
	1.	What is meant by ISI in communication system? How it can be minimize ?	K2	C501.3
	2.	Generalize the function of equalization filter.	K1	C501.3
	3.	Outline the causes for ISI.	K1	C501.3
	4.	Quote the necessity of Equalization.	K1	C501.3
	5.	Point out duo binary system. What are the drawbacks of it?	K2	C501.3
	6.	Quote the necessity of Equalization.	K1	C501.3

PART – B (1 X 13 = 13 Marks)							
II	**ANSWER ALL QUESTIONS**				Marks	**BT Level**	**CO**
	07.	(a)		What is ISI? List the various methods to remove ISI in s communication system. Also state and prove Nyquist first criterion for Zero ISI.	13	K3	C501.3
				(OR)			
		(b)		(i) Analyze the differential encoder with neat block diagram. (ii) Identify the merits and demerits of Duo binary signaling.	13	K3	C501.3
III	**ANSWER ALL QUESTIONS**				Marks	**BT Level**	**CO**
	PART – C (5 X 1 = 5 Marks)						
	08 to 12			Multiple Choice Questions https://forms.gle/WuLXZjS89smmFYqy9	5	K2	CO3
	Part – D (5 x 2 = 10 Marks)						
	13 to 17			Multiple Choice Questions https://forms.gle/WuLXZjS89smmFYqy9	10	K2	CO3

Blooms Levels: K1 - Remember, K2 – Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 – Create

M.Shiva Shankari AP/ECE	**Dr.J.Jeyarani**	**Dr.S.Shanthi**
Faculty In-charge	**HOD**	**Principal**

CARE
COLLEGE OF ENGINEERING
(Approved by AICTE and Affiliated to Anna University, Chennai)
27, Thayanur, Trichy – 620009

INTERNAL QUALITY ASSURANCE CELL [IQAC]

Question Paper Audit Format

Department:ECE | Auditor : M.Shiva Shankari

S.No.	Faculty Name	Course Code	Course Name	UT (I-II) / CT (I-II) / Model	Part-A (BTL)	Part-B (BTL)	Part-C (BTL)	MCQ (BTL)	Assignment (BTL)	Seminar/ other Activities (BTL)	Status
1	Ms.R.Deepalakshmi	EC8791	Embedded and Real Time Systems	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
2	Ms.R.Vanitha	EC8701	Antennas and Microwave Engineering	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
3	Mr.S.Sriram Sundar	EC8751	Optical Communication	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
4	Dr.J.Jeyarani	EC8702	Ad hoc and Wireless Sensor Networks	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
5	Ms.M.Shivashankari	EC8501	Digital Communication	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
6	Ms.K.Rubitha	EC8553	Discrete-Time Signal Processing	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
7	Ms.J.Jecintha	EC8552	Computer Architecture and Organization	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
8	Ms.R.Deepalakshmi	EC8551	Communication Networks	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
9	Ms.R.Vanitha	EC8351	Electronic Circuits- I	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
10	Ms.K.Rubitha	EC8352	Signals and Systems	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
11	Ms.M.Shivashankari	EC8392	Digital Electronics	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
12	Ms.J.Vinitha	EC8691	Microprocessors and microcontroller	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
13	Ms.J.Vinitha	ME8791	Mechatronics	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
14	Mr.S.Sriram Sundar	CS8351	Digital Principles and system design	UT-II	Available	Available	NA	Available	NA	NA	Uploaded
15	Ms.J.Jecintha	EC8395	CommunicationEngineering	UT-II	Available	Available	NA	Available	NA	NA	Uploaded

* NA - Not Applicable.

Auditor

IQAC Co-Ordinator

Principal

Roll Number							

CARE COLLEGE OF ENGINEERING, TRICHY
DEPARTMENT OF ECE

CLASS:	**:**	**III B.E ECE**	**MAX MARKS**	**:**	**50**
SEMESTER:	**:**	**V**	**DURATION**	**:**	**1.30 hrs**
SUBJECT:	**:**	**DIGITAL COMMUNICATION**	**CODE**	**:**	**EC8501**
COURSE NO	:	**C501**	**DATE**	**:**	**10.11.2021/FN**
ACADEMIC YEAR	:	**2021 – 22 (ODD)**	**EXAM**	**:**	**Cycle Test-2**

PART – A (5 X 2 = 10 Marks)				
I	**ANSWER ALL QUESTIONS**		**BT level**	**CO**
	1.	Bring out the difference between carrier recovery and clock recovery	K1	C501.3
	2.	How does pulse shaping reduce ISI?	K2	C501.3
	3.	What is the major advantage of coherent PSK over coherent ASK?	K2	C501.4
	4.	Give the probability of error of PSK with that of FSK	K2	C501.4
	5.	Define QAM	K2	C501.4

PART – B (2 X 13 = 26 Marks)							
II	**ANSWER ALL QUESTIONS**				Marks	**BT Level**	**CO**
	08.	(a)		Discuss how nyquist criterion eliminates interference in the absence of noise for distortion less baseband binary transmission.	13	K3	C501.3
				(OR)			
		(b)		Point out the types of adaptive equalizers in detail with neat diagrams.	13	K3	C501.3
	09.	(a)		Summarize the transmitter, receiver and generation of non-coherent version of PSK with neat sketch. derive the power spectral density of binary PSK signal	13	K3	C501.4
				(OR)			
		(b)		Outline the generation and detection of a coherent ASK signal and derive the power spectral density of binary ASK signal and plot it.	13	K3	C501.4
				PART – C (14 X 1 = 14 Marks)			
	10		a.	Analyze the transmitter, receiver and signal space diagram of QAM	14	K2	C501.4
				(OR)			
			b.	A set of binary data is sent at the rate of R_b= 100 Kbps over a channel with 60 dB transmission loss and power spectral density η= 10-12 W/Hz at the receiver. Evaluating the transmitted power for a bit error probability P_e= $10^{-3}$for the following modulation schemes. (a) FSK (b) PSK (c) DPSK (d) 16 QAM	14	K2	C501.4

Blooms Levels: K1 - Remember, K2 – Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 – Create

M.Shiva Shankari AP/ECE
Faculty In-charge

Dr.J.Jeyarani
HOD

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Question Paper Audit Format

Department:ECE | Auditor : M.Shiva Shankari

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1	Ms.R.Deepalakshmi	EC8791	Embedded and Real Time Systems	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
2	Ms.R.Vanitha	EC8701	Antennas and Microwave Engineering	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
3	Mr.S.Sriram Sundar	EC8751	Optical Communication	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
4	Dr.J.Jeyarani	EC8702	Ad hoc and Wireless Sensor Networks	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
5	Ms.M.Shivashankari	EC8501	Digital Communication	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
6	Ms.K.Rubitha	EC8553	Discrete-Time Signal Processing	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
7	Ms.J.Jecintha	EC8552	Computer Architecture and Organization	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
8	Ms.R.Deepalakshmi	EC8551	Communication Networks	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
9	Ms.R.Vanitha	EC8351	Electronic Circuits- I	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
10	Ms.K.Rubitha	EC8352	Signals and Systems	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
11	Ms.M.Shivashankari	EC8392	Digital Electronics	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
12	Ms.J.Vinitha	EC8691	Microprocessors and microcontroller	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
13	Ms.J.Vinitha	ME8791	Mechatronics	CT-II	Available	Available	Available	NA	NA	NA	Uploaded
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* NA - Not Applicable

Auditor

IQAC Co-Ordinator

Principal

Reg Number												

CARE COLLEGE OF ENGINEERING, TRICHY

DEPARTMENT OF ECE

CLASS:	**:**	**III B.E ECE**	**MAX MARKS**	**:**	**100**
SEMESTER:	**:**	**V**	**DURATION**	**:**	**3 hrs**
SUBJECT:	**:**	**DIGITAL COMMUNICATION**	**CODE**	**:**	**EC8501**
COURSE NO	:	**C501**	**DATE**	**:**	
ACADEMIC YEAR	:	**2021 – 22 (ODD)**	**EXAM**	**:**	**Model Exam**

PART – A (10 X 2 = 20 Marks)				
I	**ANSWER ALL QUESTIONS**		**BT level**	**CO**
	1.	What is entropy and give its mathematical equation	K1	C501.1
	2.	State the properties of mutual information	K1	C501.1
	3.	What is meant by slope overload distortion in DM system? How it can be avoided?	K2	C501.2
	4.	Illustrate the difference between DM and ADM	K2	C501.2
	5.	Give the practical difficulties of ideal Nyquist channel	K1	C501.3
	6.	Show the frequency response of duo binary signal	K1	C501.3
	7	Indicate why PSK always preferable over ASK in Coherent detection	K2	C501.4
	8	Design a carrier synchronization using Mth power loop	K2	C501.4
	9	What is the unique characteristic of convolutional code which make it different from linear codes?	K2	C501.5
	10	Show how Trellis diagram is used to represent the code generated by convolutional coder and mention its advantages	K1	C501.5

PART – B (5 X 13 = 65 Marks)							
II	**ANSWER ALL QUESTIONS**				Marks	BT Level	CO
	11.	(a)		Reproduce Shannon's all the three laws that govern the Information theory.	13	K3	C501.1
				(OR)			
		(b)		A discrete source emits symbols with the following probabilitiesp(x)={0.07,0.08,0.04,0.26,0.14,0.09,0.07,0.25}.Using Huffman code determine the coding efficiency and redundancy	13	K3	C501.1
				(OR)			
	12	(a)		Describe delta modulation transmitter and receiver with their block diagram	13	K2	C501.2
				(OR)			

		(b)		Write the comparison of various line coding techniques based on parameter of line coding formats	13	K2	C501.2
	13	(a)		Generalize the realizations of the receiving filters based on the signal correlator and matched filter	13	K2	C501.3
				(OR)			
		(b)		What is ISI? List the various methods to remove ISI in s communication system. Also state and prove Nyquist first criterion for Zero ISI.	13	K2	C501.3
	14	(a)		Discuss the non-coherent detection of FSK signal and derive the expression for the probability of error	13	K2	C501.4
				(OR)			
		(b)		Analyze the transmitter, receiver, signal space diagram of QAM	13	K2	C501.4
	15	(a)		Illustrate how the errors are corrected using hamming code with an example.	13	K3	C501.5
				(OR)			
		(b)		Find the (7,4) systematic and non-systematic cyclic code words of the message word 1101.Assume the generator polynomial as 1+x2+x3	13	K3	C501.5
III	**ANSWER ALL QUESTIONS**				Marks	**BT Level**	**CO**
				PART – C (1 X 15 =1 5 Marks)			
	16	(a)		Binary data is transmitted using PSK at rate 2Mbps over RF link having bandwidth 2MHz. Find signal power required at the receiver input so that error probability is less than or equal to 10^-4 Assume noise PSD to be 10^-10Watt/Hz. (Q(3.71)=10^-4).	15	K3	C501.4
				(OR)			
		(b)		A convolutional code is described by the following generator sequences, g(1)= {1,0,1}, g(2)= {1,0,0}, g(3)= {1,1,1}. (i) Draw the encoder to this code (ii) Draw the state diagram (iii) If the message sequence is 10110, Design the code word	15	K3	C501.5

Blooms Levels: K1 - Remember, K2 – Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 – Create

Faculty In-charge
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HOD
Dr.J.Jeyarani

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*NA - Not Applicable

Auditor

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CARE COLLEGE OF ENGINEERING

INTERNAL TEST PERFORMANCE ANALYSIS

ODD SEMESTER III ECE/ V SEM INTERNAL ASSESSMENT SHEET (2019-2023) BATCH

S.NO	REG NO	NAME	No.of Univ. Arrears	EC8501, Digital Communication, Ms.M.Shivashankari	EC8501, Digital Communication, Ms.M.Shivashankari	EC8501, Digital Communication, Ms.M.Shivashankari	EC8501, Digital Communication, Ms.M.Shivahsankari	Retest	EC8501, Digital Communication, Ms.M.Shivashankari	Additional test Makeup
				UT 1	CT1	UT2	CT2	CT2	Model	Model
				100	100	100	100	100	100	100
1	810719106001	Adithya P	Nil	90	92	66	42		92	92
2	810719106002	Ajay Kumar K	Nil	92	82	80	AB	38	63	63
3	810719106003	Citybabu M	1	86	72	78	50		66	66
4	810719106004	Dhinakaran S	Nil	54	58	54	20		10	10
5	810719106005	Gunasekaran S	1	84	85	82	AB	56	85	85
6	810719106006	Nishanth K	Nil	70	87	68	52		51	51
7	810719106007	Nithya R	1	70	60	66	18		22	22
8	810719106008	Raja Rajeswari S	Nil	98	96	86	80		79	79
9	810719106009	Vijei R	Nil	92	80	68	54		49	49

Total No. of Students		9	9	9	9	2	9	9
Total No. of Pass for 50		9	9	9	4	1	6	6
Total Absentees		0	0	0	2	0	0	0
Pass Percentage % for 50		100.00	100.00	100.00	44.44	50.00	66.67	66.67
Mean of Marks		81.78	79.11	72.00	35.11	47.00	57.44	57.44
Total No. of Pass for 70		8	7	4	1	0	3	3
Pass Percentage % for 70		88.89	77.78	44.44	11.11	0.00	33.33	33.33

Shiva Shankari
Signature of faculty

J. Tayani
HOD

PART - A.

810719106004

UNIT TEST-1 SAMPLE

26/50

(2)

* The mutual information of a channel is symmetric

$$I(x:Y) = I(Y:x)$$

* The mutual information is always non negative

$$I(x:Y) \geq 0$$

* The mutual information of a channel may be expressed in terms of the entropy of the channel output as

$$I(x:Y) = H(Y) - H(Y|X)$$

* The mutual information of a channel is related to the joint entropy of the channel input and channel output by

$$I(x:Y) = H(x) + H(Y) - H(x,Y)$$

2

(3) For the discrete memoryless channels; input and output both are discrete random variable. The current output depends only upon current input for such channel.

2

(4) $P_0 = \frac{1}{2}, P_1 = \frac{1}{4}, P_2 = \frac{1}{8}, P_3 = \frac{1}{16}, P_4 = \frac{1}{32}, P_5 = \frac{1}{35}$

$$H = \sum P_k \log_2 (1/P_k)$$

$$= \left(\frac{1}{2}\right)\log_2(2) + \left(\frac{1}{4}\right)\log_2(4) + \left(\frac{1}{16}\right)\log_2(16)\left(\frac{1}{32}\right)\log_2(32) + \left(\frac{1}{32}\right) + \left(\frac{1}{32}\right)\log_2(32)$$

$$= 1.5625.$$

2

810719106009

(iii) Shannon Fano Coding: 46/50

Symbol	Probability	I	II	III	IV	Code word	n_k
s_2	0.3	0	0			00	2
s_1	0.2	0	1			01	2
s_5	0.18	1	0			10	2
s_4	0.16	1	1	0		110	3
s_3	0.11	1	1	1	0	1110	4
s_6	0.05	1	1	1	1	1111	4

$$\bar{N} = \sum_{k=1}^{6} P_k n_k = 0.3 \times 2 + 0.2 \times 2 + 0.18 \times 2 + 0.16 \times 3 + 0.11 \times 4 + 0.05 \times 4$$

$$\Rightarrow 2.48 \text{ bits/symbol.}$$

$$\eta = H/\bar{N} = \frac{2.4202}{2.48} = 0.9759.$$

Part-B

7)a) Entropy of the source

Here $P_1 = 0.2$, $P_2 = 0.3$, $P_3 = 0.11$, $P_4 = 0.14$, $P_5 = 0.15$, $P_6 = 0.05$

$$H = -\sum_{k=1}^{6} P_k \log_2 P_k$$

$$= -[P_1 \log_2 P_1 + P_2 \log_2 P_2 + \cdots + P_6 \log_2 P_6]$$

$$= -[0.2 \log_2 0.2 + 0.3 \log_2 0.3 + 0.11 \log_2 0.11 + 0.16 \log_2 0.16 + 0.18 \log_2 0.18 + 0.05 \log_2 0.05]$$

$$= 2.4202 \text{ bits/symbol.}$$

(i) Huffman Coding.

Symbol	Probability					Bits obtained by tracing	Code word	n_k
	I	II	III	IV	V	$b_3\ b_2\ b_1\ b_0$	$b_0\ b_1\ b_2\ b_3$	
s_2	0.3 →	0.3 →	0.32 →	0.38 →	0.62	0 1 0	0 1	2
s_1	0.2 →	0.2 →	0.3 →	0.32 →	0.38	0 0 1	1 0	2
s_5	0.15 →	0.18 →	0.2 →	0.3		1 1	1 1	2
s_4	0.14 →	0.16 →	0.18			1 0 0	0 0 1	3
s_3	0.11 →	0.14				0 0 0 0	0 0 0 0	4
s_6	0.05					1 0 0 0	0 0 0 1	4

$$\bar{N} = \sum_{k=1}^{6} P_k n_k = 0.3 \times 2 + 0.2 \times 2 + 0.18 \times 2 + 0.16 \times 3 + 0.11 \times 4 + 0.05 \times 4$$

$$= 2.48 \text{ bits/symbol}$$

$$\eta = H/\bar{N} = \frac{2.4202}{2.48} = 0.9759$$

41

50

Reg NO: 810719106002

EC8501 DIGITAL COMMUNICATION

PART A

① Lempel-Ziv coding:-

* LZW algorithm no prior information about the input data stream.

* LZW can compress the input stream in one single pass

* Another advantages of LZW its simplicity allowing fast execution.

② Shannon's limit?

The Shannon capacity defines the maximum amount of information or data capacity, which can be sent over a channel or medium (wireless, lost, signal & noise fibers etc).

③ communication channel?

The channel capacity, C is defined to be the maximum rate at which information can be transmitted through a channel. The fundamental theorem of information theory of says that for any rate below channel capacity, an error control code can be designed whose probability of error is arbitrarily small.

(6) The form pseudoternary to the use of 3 encoded signal levels to represent two level (binary) data this is also called alternate mark inversion (AMI signaling)

7) Waveform coding?

The signal which varying with time can be digitized by periodic time sampling and amplitude quantization.

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INTERNAL QUALITY ASSURANCE CELL [IQAC]

Answer Paper Audit Format

Department: ECE | Idfter :M.Shiva Shankari /E

S No	Faculty Name	Course Code	Course Name	UT (I-II) / CT (I-II) / Model	Part-A		Part-B		Part-C		MCQ		Assignment		Seminar/other Activities		Status	Audited Answer sheet students Name	Corrections
					Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Attendance	Evaluated Mark			
1	Ms.R.Deepalakshmi	EC8791	Embedded and Real Time Systems	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	BHARKIYA R JAYAPRASAD S MOHAMED RIYAS K	CO Marks to be graded
2	Ms.R. Vanitha	EC8701	Antennas and Microwave Engineering	UT 1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	SHIFANA BEGUM K JAYAPRASAD S KEERTHICK ROSHAN P	NIL
3	Mr.S.Sriram Sundar	EC8751	Optical Communication	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	DIVAGAR A KEERTHICK ROSHAN P MOHAMED RIYAS K	NIL
4	Dr.J.Jeyarani	EC8702	Ad hoc and Wireless Sensor Networks	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	SHIFANA BEGUM K LAKSHMI PRIYA N BALAKRISHNAN V	NIL
5	Ms. M.Shivashankari	EC8501	Digital Communication	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Dhinakaran S Raja Rajeswari S Vijay R	NIL
6	Ms.K Rubidha	EC8553	Discrete-Time Signal Processing	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Dhinakaran S Gunasekaran S Nishanth K	NIL
7	Ms.J.Jeeretha	EC8552	Computer Architecture and Organization	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Nithya R Raja Rajeswari S Adithya P	NIL
8	Ms.R.Deepalakshmi	EC852.	Communication Networks	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Nishanth K Nithya R Raja Rajeswari S	

9	Ms.K.Vanitha	EC8351	Electronic Circuits-I	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	G.VIGNESHWARAN S.KRISHNAMOORTHI R.JANCY RANI	NIL
10	Ms.K.Kalaiha	EC8352	Signals and Systems	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	K.BALAMURUGAN M.AFROSE JAMILA R.JANCY RANI	
11	Ms.M.Shivashankari	EC8392	Digital Electronics	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	GADIREDDY SAMEERA R.GOKUL KANCHU LOKESH	NIL
12	Ms.J.Vinitha	EC8691	Microprocessors and microcontroller	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Chicki Jitha Nithishanthick R Syed Jaffer Sadiq	Marks to be graded
13	Ms.J.Vinitha	ME8391	Mechanurics	UT-1	12		13		NA		13				10		CO-PO sheet verified with ans sheet	Harish Natarajan K Deepakkumar M Surya K	NIL
14	Mr.S Sarun Sunda	CS8351	Digital Principles and system design	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	MAHESH E MOHAMED ISMAIL K SAKTHI SHREE M	NIL
15	Ms.L.Vanitha	EC8393	Communication Engineering	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Mahesh, Praveenkash, Lokesh	NIL
16	Mr.R.Saravanan	EC8391	Control System Engineering	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	R.JANCY RANI KANCHU LOKESH S.KRISHNAMOORTHI	NIL
17	Mr.Mahaceevan	CC 8393	Fundamentals of Data Structures	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	G.VIGNESHWARAN R.GOKUL GADIREDDY SAMEERA	Marks to be graded
18	Dr. Lalitha Bhaskara	OCS751	Waste Water Treatment	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	DIVAGAR A GOPINATH M SURIYA S	NIL
19	Dr.A.Pravinson Pau	CS8082	Machine Learning Techniques	UT-1	12		13		NA		12				10		Not available	Not available	NOTED

20	Mr.S.Maneshwaran	OE8017	Total Quality Management	UT-1	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Raja Rajeswari S Nithya R Ajay Kumar K	NOTED
21	Mr.Sheik Imam	OCE551	Air pollution and control Engineering	UT-1	12		13		NA		15				10		Not available	Not available	NOTED

*NA - Not Applicable

Auditor

IQAC Co-Ordinator

Principal

CYCLE TEST-1 SAMPLE

R. Nithya

810719106004

Cycle Test - 1

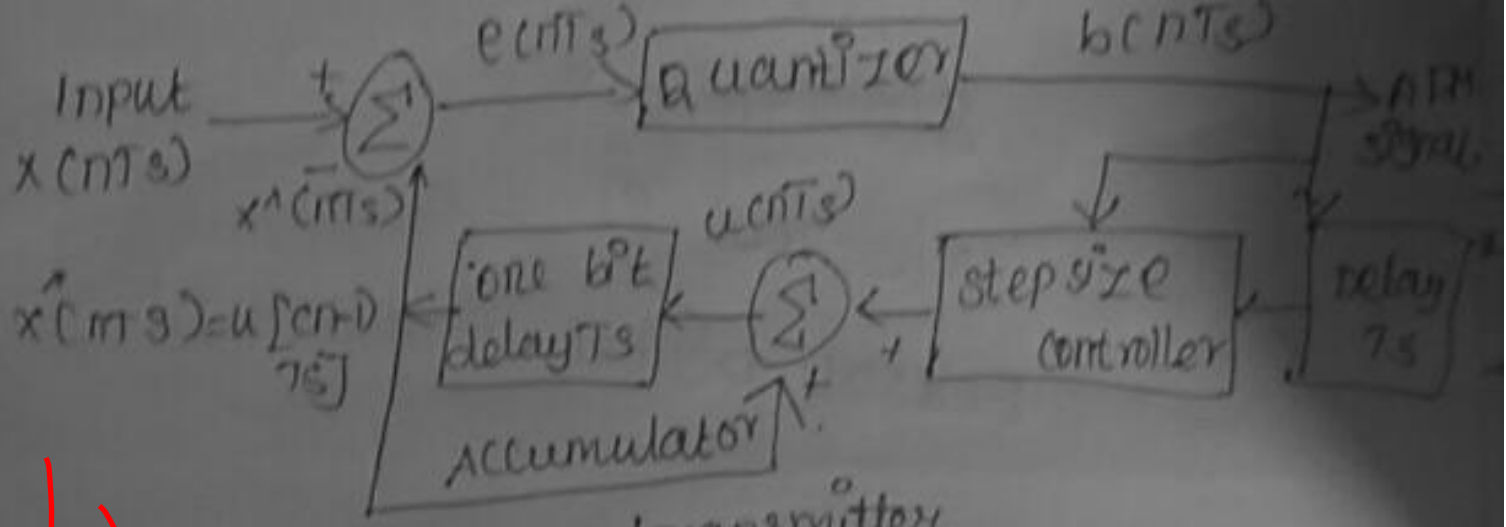
EC8501 Digital communication

30/50

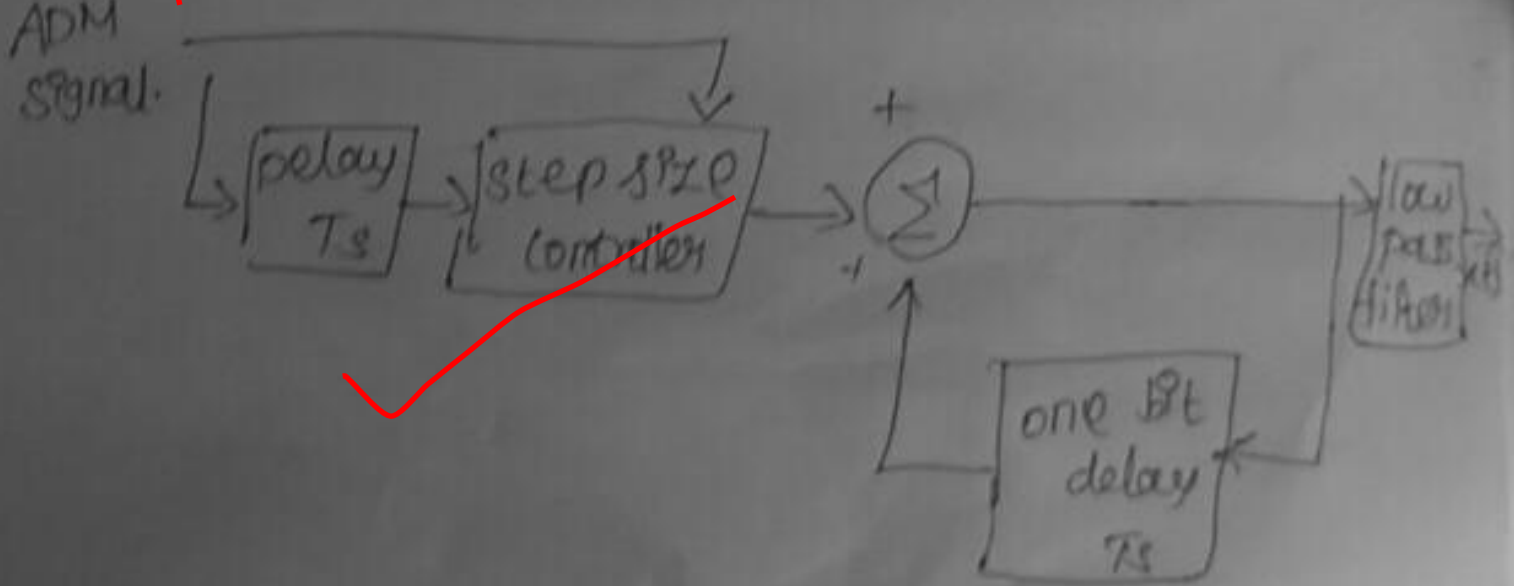
9(b).

Adaptive Delta Modulation :

To overcome the quantization errors due to slope overload and granular noise the step size $\Delta(n)$ is made adaptive to variations in the input signal $x(t)$ particularly in the steep segment of the signal $x(t)$ the step size is increased.



(a) transmitter



44/50

(6) The form pseudoternary to the use of 3 encoded signal levels to represent two-level (binary) data this is also called alternate mark inversion (AMI signaling)

2

7) Wave form coding?

The signal which varying with time can be digitized by periodic time sampling and amplitude quantization.

2

PART-B

(8) (b)

Symbol	s_0	s_1	s_2	s_3	s_4
probability	0.55	0.15	0.15	0.10	0.05

Sol:

The two different Huffman codes are obtained by placing the combined probability as high as possible and as low as possible

(1) Placing combined as high as possible

Symbol	Probability Stage-I	II	III	IV	Code obtained by 2 sources	Huffman code	nk
s_0	0.55 →	0.55 →	0.55 →	0.55	0	0	1
s_1	0.15	0.15 →	0.3 →	0.45	001	100	3
s_2	0.15	0.15	0.15		101	101	3
s_3	0.01 →	0.05			011	110	3
s_4	0.05				111	111	3

(i) Average code word length

$$\bar{n} = \sum_{k=0}^{4} n_k \cdot p_k$$

$$= (0.55 \times 1) + (0.15 \times 3) + (0.15 \times 3) + (0.1 \times 3) + (0.05 \times 3)$$

$$= 1.9 \text{ bits/ symbol}$$

(ii) variance of the code

$$\sigma^2 = \sum_{k=0}^{4} p_k [n_k - \bar{n}]^2$$

$$= 0.55[1-1.9]^2 + 0.15[3-1.9]^2 + 0.15[3-1.9]^2 + 0.1[3-1.9]^2 + 0.05[3-1.9]^2$$

$$= 0.99$$

(3) Placing combined probability as close as possible

Symbol	probability stage-I	II	III	IV	code obtained by tracing	Huffman code	n_k
S_0	0.55 →	0.55	0.55	0.55	0	6	1
S_1	0.15 →	0.15	0.3	0.45	11	11	2
S_2	0.15 →	0.15	0.15		001	100	3
S_3	0.1 →	0.15			0101	1010	4
S_4	0.05 →				1101	1011	4

(i) Average code - word length:

$$\bar{n} = \sum_{k=0}^{4} p_k l_k$$

$$= (0.55 \times 1) + (0.15 \times 2) + (0.15 \times 3) + (0.1 \times 4) + (0.05 \times 4)$$

$$= 1.9 \text{ bits / symbol}$$

(ii) variance of the code

$$\sigma^2 = \sum_{k=0}^{4} p_k [l_k - \bar{n}]^2$$

$$= 0.55 [1-1.9]^2 + 0.15 [2-1.9]^2 + 0.15 [3-1.9]^2 + 0.1 [4-1.9]^2 + 0.05 [4-1.9]^2$$

$$= 1.29.$$

Results:

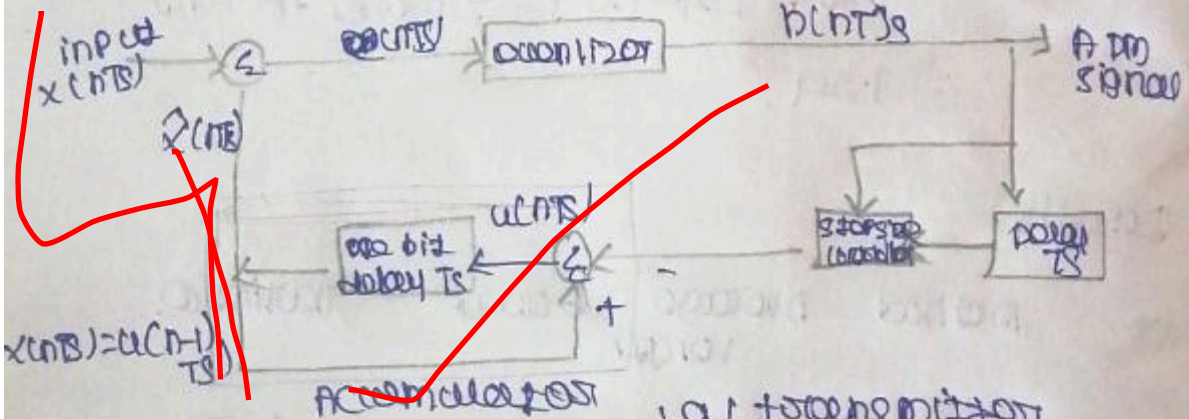
S.no	method	Average code word length	variance
1.	as high as possible	1.9	0.09
2.	as low as possible	1.9	1.29.

9(b) adaptive delta modulation

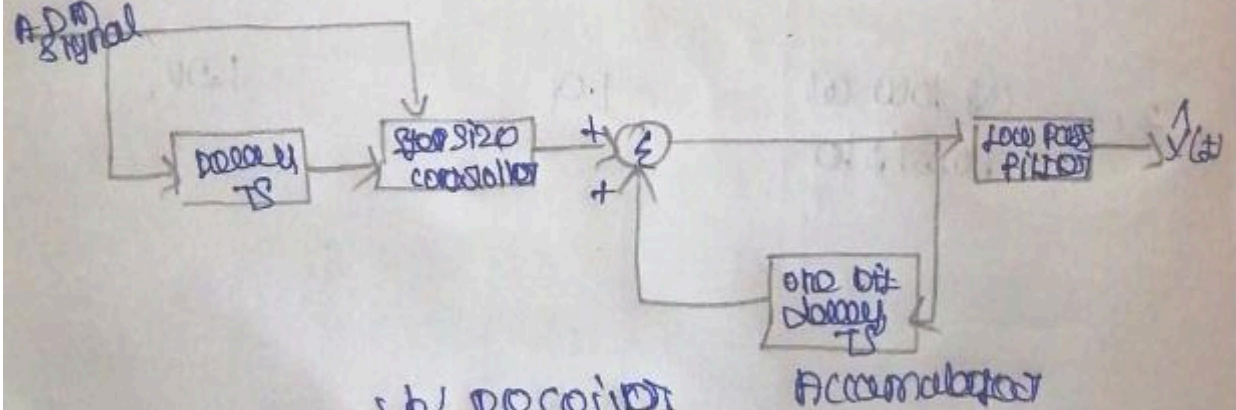
To overcome the accentization errors due to slope overload and granular noise the step size (δ) is made adaptive to variations in the input signal x(t),

particularly in the steep segment of the signal x(t), the step size is increased.

When the input is varying slowly the step size is reduced. Then the method is called Adaptive Delta modulation (ADM)



(a) Transmitter.



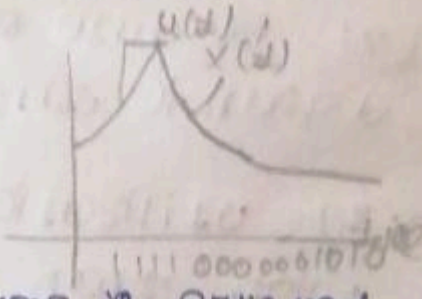
(b) Receiver Accumulator

Adaptive delta modulator

The adaptive delta modulators can have continuous changes in step size or discrete changes in step size.

The logic for step size control is added in the diagram. The step size for increases or decreases according to certain criteria depending on one bit comparison output.

In the receiver of adaptive delta modulator (b) the first block generates the step size from each incoming bit.



Exactly the same process is followed as that in transmitter. The previous input and present input decides the step size. It is then given to an accumulator which builds up staircase waveform. The low pass filter then smoothens out the staircase waveform to reconstruct the speech signal.

continuously variable slope delta modulation (CVSD)

In ADM, the step size changes in discrete steps. When the step size varies continuously, then it is called continuously variable slope delta modulation (CVSD)

Advantages of adaptive Delta modulation

Adaptive delta modulation has certain advantages over delta modulation.

(1) The signal to noise ratio is better in adaptive delta modulation because of the reduction in slope overload distortion and granular noise.

(2) Because of the variable step size, the dynamic range of ADM is wide.

(3) Utilization of bandwidth is better than delta modulation.

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Part - A

810719106008

1. Lempel - Ziv Coding:

i) It doesnot require prior Probabilities of the data sequences.

ii) This algorithm is adaptive

iii) It gives higher Coding efficiencies for longer data sequences.

2 2.

$$C_\infty = 1.44 \, S/N_0$$

$$S = E_b C = E_b C_\infty$$

$$C_\infty = 1.44 \, \frac{E_b C_\infty}{N_0}$$

$$E_b/N_0 = 1/1.44$$

$$\left(E_b/N_0\right) dB = 10 \log_{10} E_b/N_0$$

$$= 10 \log_{10} 1/1.44 = -1.6 \, dB$$

$$B \to \infty, \quad E_b/N_0 \to -1.6 dB$$

3.

→ Increasing the bandwidth 'B' of the channel

→ Increasing the signal to noise ratio of the channel.

→ Maximizing the average mutual information.

4.

$f_m = 10kHz$

$W = f_m = 10kHz$

Nyquist rate $= 2W = 2 \times 10kHz$

$= 20kHz$

$f_s = 10 \times$ Nyquist rate

$f_s = 10 \times 20kHz = 200kHz$

$T_s = 1/f_s = 1/200kHz = 1/200 \times 10^3$ Sec

$\frac{S}{N} = \frac{3}{8\pi^2 W f_m^2 T_s^2}$

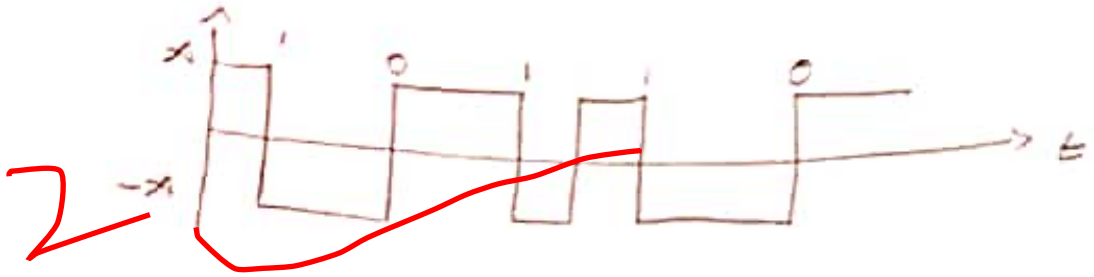
$= \frac{3}{8\pi^2 \times 10 \times 10^3 \times (10 \times 10^3)^2 \times \left(\frac{1}{200 \times 10^3}\right)^2}$

$= 303.96$

$= 10 \log_{10} 303.96$

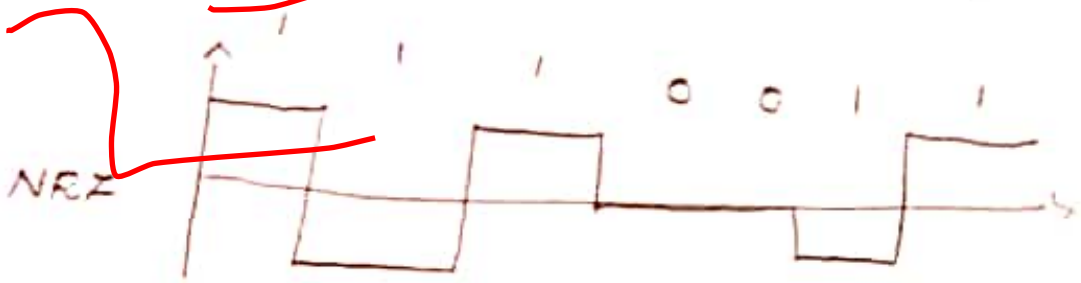
$= 24.83 dB$

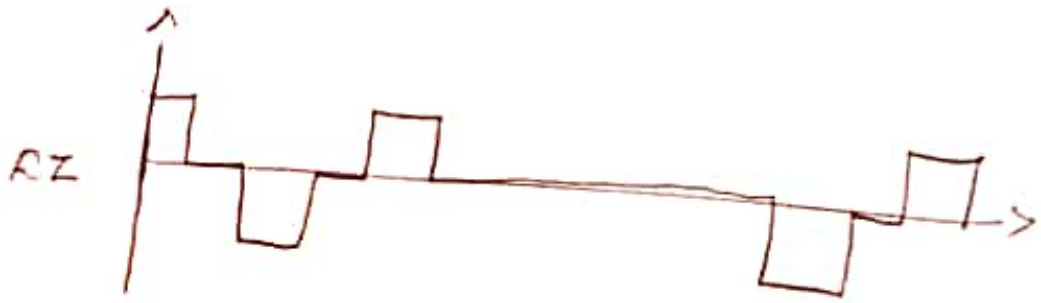
5.



6.

Successive is are coded with alternate positive and negative pulses. There are no pulses for zeros. Thus there are three voltage levels, +1, -1 and 0. It can be NRZ as well as RZ type.





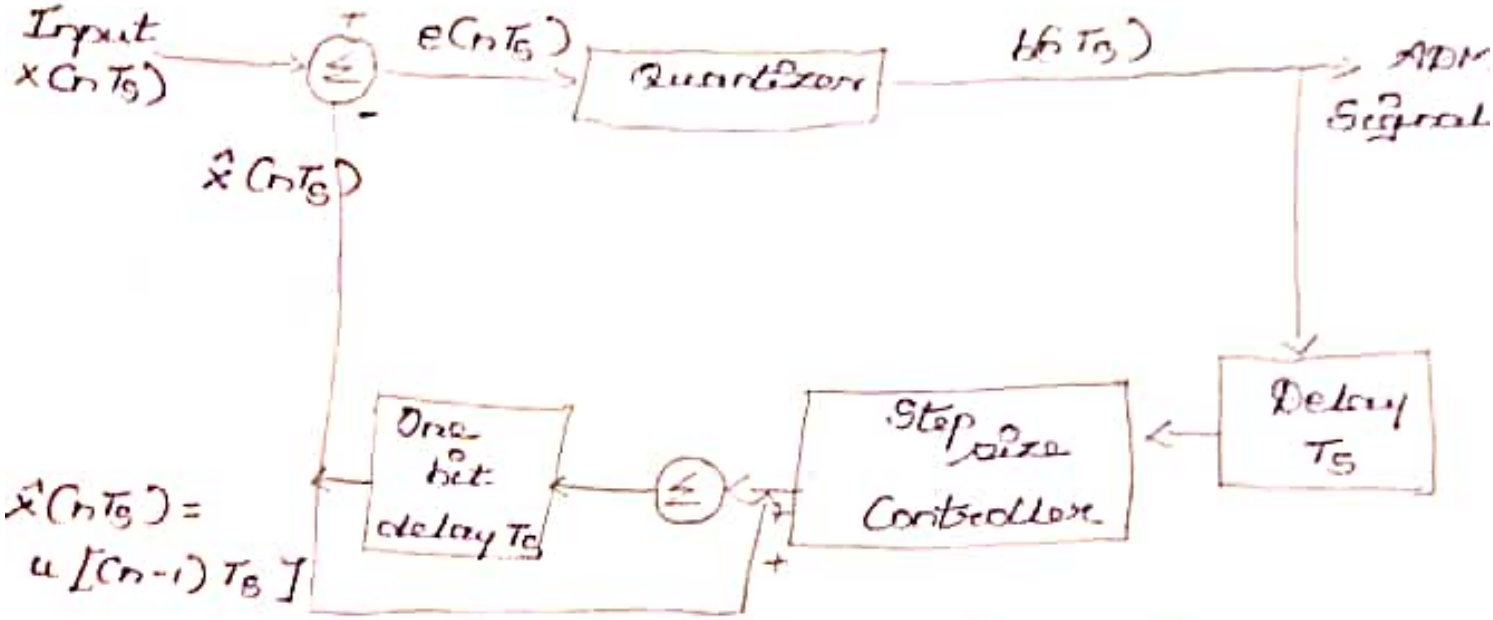
7.

→ The Signal which is varying with time can be digitized by periodic time sampling and amplitude quantization. This process is called temporal waveform Coding.

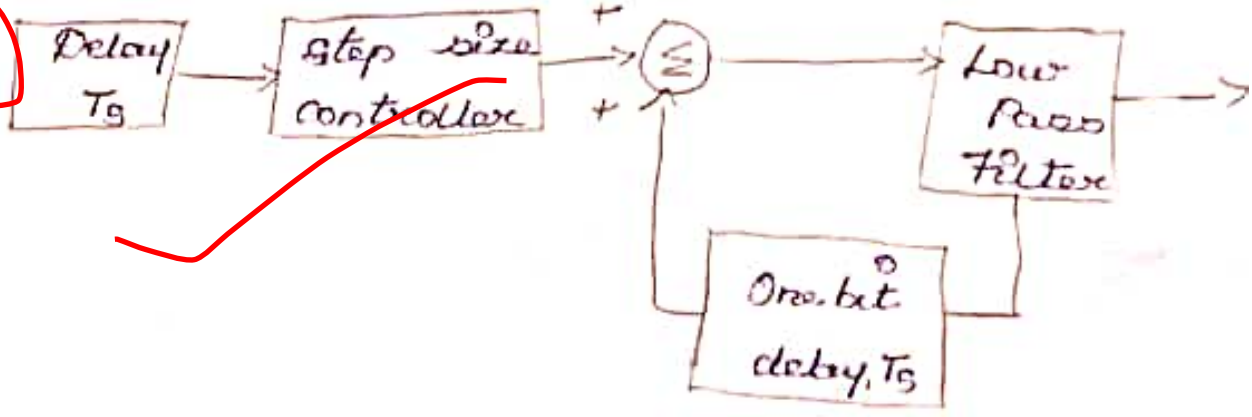
→ The Signals such as Speed, video etc. can be Coded using temporal waveform Codings.

9.b) ADM: Adaptive Delta Modulation

To overcome the quantization errors due to slope overload and granular noise, the step size (Δ) is made adaptive to variations in the input signal $x(t)$. Particularly in the steep segment of the signal $x(t)$, the step size is increased. When the input is varying slowly, the step size is reduced. Then the method is called Adaptive Delta modulation (ADM).

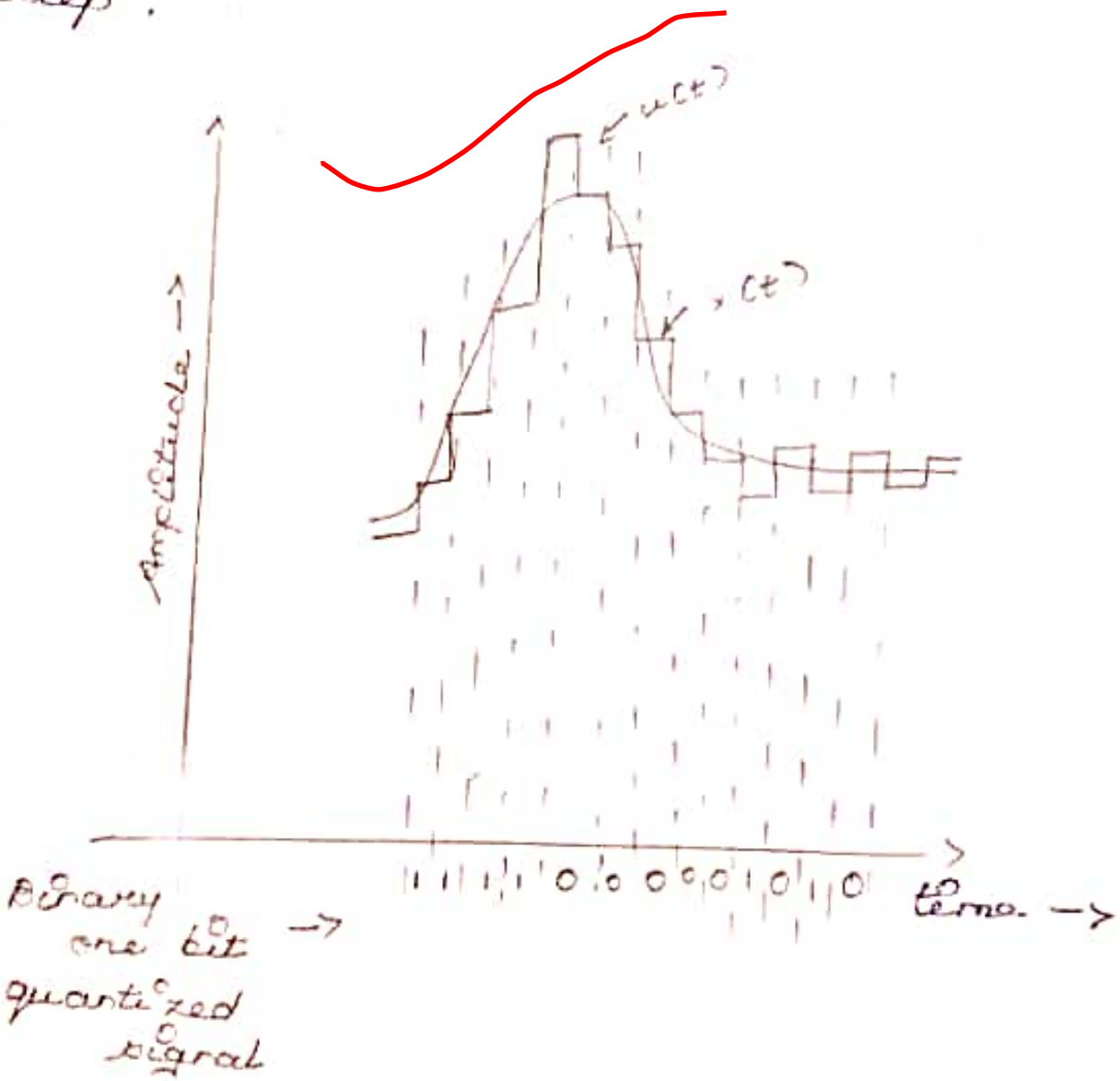


a) Transmitter



b) Receiver

The Logic for step size control is added in the diagram. The step size increases or decreases according to certain rule depending on one bit quantizer output. For example if one bit quantizer output is high (1), then step size may be doubled for next sample. If one bit quantizer output is low, then step size may be reduced by one step.



In the receiver of adaptive delta modulator the first part generates the step size from each incoming bit. Exactly the same process is followed as that in transmitter. The previous input and present input decides the step size.

Continuously Variable slope delta modulation CCVSDM:

In ADM, the step size changes in discrete steps. When the step size varies continuously, then it is called continuously variable slope delta modulation CCVSDM.

Advantages of Adaptive Delta Modulation:

→ The signal to noise ratio is better than ordinary delta modulation because of the reduction in slope overload distortion and granular noise.

→ Because of the variable step size, the dynamic range of ADM is wide.

→ Utilization of bandwidth is better than delta modulation.

8.6) Sol:

The Two different Huffman codes are obtained by placing the combined probability as high as possible or low as possible.

i) placing Combined as high as possible:

Symbol	Probability Stage -I	II	III	IV	Code obtained	Huffman Code	n_k
S_0	0.55	0.55	0.55	0.55	0	0	1
S_1	0.15	0.15	0.3	0.45	001	100	3
S_2	0.15	0.15	0.15		101	101	3
S_3	0.1	0.15			011	110	3
S_4	0.05				111	111	3

ii) Average Code Word length

$$\bar{N} = \sum_{k=0}^{4} P_k n_k$$

$$= (0.55 \times 1) + (0.15 \times 3) + (0.15 \times 3) + (0.1 \times 3) + (0.05 \times 3)$$

$$= 1.9 \text{ bits / Symbol}$$

iii) Variance of the Code.

$$\sigma^2 = \sum_{k=0}^{4} P_k [n_k - \bar{N}]^2$$

$$= 0.55[1-1.9]^2 + 0.15[3-1.9]^2 + 0.15[3-1.9]^2 + 0.1[3-1.9]^2 + 0.05[3-1.9]^2$$

$$= 0.99$$

2) placing Combined probability as low as possible:

Symbol	Probability Stage I	II	III	IV	Code obtained by tracing	Huffman Code	n_k
S_0	0.55	0.55	0.55	0.55	0	0	1
S_1	0.15	0.15	0.3	0.45	11	11	2
S_2	0.15	0.15	0.15		001	100	3
S_3	0.1	0.15			0101	1010	4
S_4	0.05				1101	1011	4

3) Average Code-word length:

$$\bar{N} = \sum_{k=0}^{4} P_k n_k$$

$$= (0.55 \times 1) + (0.15 \times 2) + (0.15 \times 3) + (0.1 \times 4) + (0.05 \times 4)$$

$$= 1.9 \text{ bits / Symbol}.$$

ii) Variance of the Code:

$$\sigma^2 = \sum_{k=0}^{4} P_k [n_k - \bar{N}]^2$$

$$= 0.55[1-1.9]^2 + 0.15[2-1.9]^2 + 0.15[3-1.9]^2 + 0.1[4-1.9]^2 + 0.05[4-1.9]^2$$

$$= 1.29$$

Results:

S.NO	Method	Average code-word length	Variance
1	as high as Possible	1.9	0.99
2	as low as Possible	1.9	1.29

3.

→ Increasing the bandwidth 'B' of the channel

→ Increasing the signal to noise ratio of the channel.

→ Maximizing the average mutual information.

4.

$f_m = 10kHz$

$N = f_m = 10kHz$

Nyquist rate $= 2N = 2 \times 10kHz$

$= 20kHz$

$f_s = 10 \times$ Nyquist rate

$f_s = 10 \times 20kHz = 200kHz$

$T_s = 1/f_s = 1/200kHz = 1/200 \times 10^3$ Sec

$S/N = 3/8\pi^2 N f_m^2 T_s^2$

$= 3/8\pi^2 \times 10 \times 10^3 \times (10 \times 10^3)^2 \times (1/200 \times 10^3)^2$

$= 303.96$

$= 10 \log_{10} 303.96$

$= 24.83 dB$

CARE

COLLEGE OF ENGINEERING

(Approved by AICTE and Affiliated to Anna University, Chennai)

27, Thayanur, Trichy – 620009

INTERNAL QUALITY ASSURANCE CELL [IQAC]

Answer Paper Audit Format

Department: ECE | Auditor :M.Shiva Shankari /ECE

S. No.	Faculty Name	Course Code	Course Name	UT (I-a) / CT (I-II) / Model	Part-A		Part-B		Part-C		MCQ		Assignment		Seminar/other Activities		Status	Audited Answer sheet students Name	Corrections
					Qns/ Allotted	Evaluated Mark	Qns/ Allotted	Evaluated Mark	Qns/ Allotted	Evaluated Mark	Qns/ Allotted	Evaluated Mark	Qns/ Allotted	Evaluated Mark	Attendance	Evaluated Mark			
1	Ms.R.Deepalakshmi	EC8791	Embedded and Real Time Systems	CT-II	14		26		NA		10				10		CO-PO sheet verified with ans sheet	BALAKRISHNAN V GOPINATH M JAYAPRASAD S	NIL
2	Ms.R.Vanitha	EC8701	Antennas and Microwave Engineering	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	SURIYA S NAGARAJAN P DIVAGAR A	NIL
3	Mr.S.Sriram Sundar	EC8751	Optical Communication	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	NAGARAJAN P BHAKKIYA R LAKSHMI PRIYA N	NIL
4	Dr.J.Jeyarani	EC8702	Ad hoc and Wireless Sensor Networks	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	SHIFANA BEGUM K GOPINATH M JAYAPRASAD S	NIL
5	Ms.M.Shivashankari	EC8501	Digital Communication	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	Ajay Kumar K Raja Rajeswari S Nithya R	NIL
6	Ms.K.Rubitha	EC8553	Discrete-Time Signal Processing	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	Gunasekaran S Citybabu M Nithya R	NIL
7	Ms.J.Jecintha	EC8552	Computer Architecture and Organization	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	Adithya P Nishanth K Nithya R	NIL
8	Ms.R.Deepalakshmi	EC8551	Communication Networks	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	Dhinakaran S Adithya P Vijei R	NIL
9	Ms.R.Vanitha	EC8351	Electronic Circuits- I	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	Adithya P Nishanth K Dhinakaran S	NIL
10	Ms.K.Rubitha	EC8352	Signals and Systems	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	KANCHU LOKESH K.BALAMURUGAN R.JANCY RANI	NIL

11	Ms.M Shivasharkari	EC8392	Digital Electronics	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	M AFROSE JAMILA S KRISHNAMOORTHI G VIGNESHWARAN	NIL
12	Ms.J Vinitha	EC8691	Microprocessors and microcontroller	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	Swetha V Balamurugan S Sanjai P	NIL
13	Ms.J Vinitha	ME879 1	Mechatronics	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	Dhamaraj P Loganathan S Deepakkumar M	NIL
14	Mr.S Sriram Sundar	CS8351	Digital Principles and system design	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	Gayathri S PRAVEENAKASH G VIJAY KRISHNA B	NIL
15	Ms.J Jeeintha	EC8395	CommunicationEngineering	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	MAHESH E NAVIN S VIGNESH NATHAN R	NIL
16	Mr.R.Saravanan	EC8391	Control System Engineering	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	GADDREDDY SAMEERA D.ANANDHACHANDRU M DINESH KUMAR	NIL
17	Mr.Mahadevan	EC 8393	Fundamentals of Data Structures	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	R.GOKUL D NITHESH S KRISHNAMOORTHI	NIL
18	Dr Lalitha Easwaran	OCY751	Waste Water Treatment	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	BALAKRISHNAN V DIVAGAR A SURIYA S	NIL
19	Dr A Pravinpon Pandian	CS8082	Machine Learning Techniques	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	SHIFANA BEGUM K GOPINATH M MUHAMED RIYAS K	NIL
20	Mr S Maheshwaran	GE8077	Total Quality Management	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	Gunasekaran S Raja Rajeswari S Nithya R	NIL
21	Mr Sheik Imam	OCE551	Air pollution and control Engineering	CT-I	14		26		NA		10				10		CO-PO sheet verified with ans sheet	Adithya P Ajay Kumar K Nishanth K	NIL

*NA - Not Applicable

Auditor

IQAC Co-Ordinator

Principal

UNIT TEST 2 SAMPLE

36/50

Roll no : 810719106003

Sub : digital communication

Sub code : EC8501

part - A

1) ISI Communication system ?

The presence of ISI in the system introduces errors in the decision device at the receiver output. There foure, in the design of the transmitting and receiving filters, the objective is to minimize the effets of ISI, and there by deliver the digital deata to its destination with the smallest error rate possible.

2) equaucation filter?

In the baseband torarsmission system, Cnearnee noise and intersymbol interferenee act together. The optimum linear receiver can be used for such transmission system.

3) out line cause for ISI ?

ISI is cesualy caused by multioath Propagation our the inherent linear our non-linear frequencye response of a Communicatio channel causing successive symools to blur

36/50

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4) Equalizers are used to render the frequency response for instance of a telephone line flat from end to end. when a channel has been equalized the frequency domain attributes of the signal at the input are faithfully reproduced at the output.

5) Duobinary modulation is a scheme for transmitting R bits/sec using less than R/2 Hz of bandwidth. while a non-return-to-zero (NRZ) system is dispersion limited at 120 km, a duobinary system is power limited at this same 120 km length of the single-mode fiber.

6) Equalizers are used to render the frequency response for instance of a telephone line flat from end to end. when a channel has been equalized the frequency domain attributes of the signal at the input are faithfully reproduced at the output.

K Nishanth
810719106006

DC

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1.) The presence of ISI in the system introduces errors in the decision device at the receiver output. Therefore in the design of the transmitting and receiving filters, the objective is to minimize the effect of ISI, and thereby deliver the digital data to its destination with the smallest error rate possible

3) ISI is usually caused by multipath propagation or the inherent linear or non-linear frequency response of a communication channel causing successive symbols to blur together. The presence of ISI in the system introduces errors in the decision device at the receiver output.

4) Equalizers are used to render the frequency response - for instance of a telephone line flat from end-to-end. When a channel has been equalized the frequency domain attributes of the signal at the input are faithfully reproduced at the output.

5) As a consequence, the effect of fiber dispersion is reduced and ultra-long WDM system applications are feasible

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Answer Paper Audit Format

Department: ECE | Auditor :M.Shiva Shankari /ECE

S.No.	Faculty Name	Course Code	Course Name	UT (I-II) / CT (I-II) / Model	Part-A		Part-B		Part-C		MCQ		Assignment		Seminar/other Activities		Status	Audited Answer sheet students Name	Corrections
					Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Attendance	Evaluated Mark			
1	Ms.R.Deepalakshmi	EC8791	Embedded and Real Time Systems	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	DEVAGAR A JAYAPRASAD S Bhakkiya	NIL
2	Ms.R.Vanitha	EC8701	Antennas and Microwave Engineering	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	SHIFANA BEGUM K BHAKKIYA R NAGARAJAN P	NIL
3	Mr.S.Sriram Sundar	EC8751	Optical Communication	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	SURIYA S LAKSHMI PRIYA N MOHAMED RIYAS K	NIL
4	Dr.J.Jeyanni	EC8702	Ad hoc and Wireless Sensor Networks	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	SURIYA S GOPINATH M JAYAPRASAD S	NIL
5	Ms.M.Shivashankar	EC8501	Digital Communication	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Gunasekaran S Vijei R Citybabu M	NIL
6	Ms.K.Rubitha	EC8553	Discrete-Time Signal Processing	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Vijei R Ajay Kumar K Citybabu M	NIL
7	Ms.J.Jecintha	EC8552	Computer Architecture and Organization	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Raja Rajeswari S Adithya P Nishanth K	NIL
8	Ms.R.Deepalakshmi	EC8551	Communication Networks	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Raja Rajeswari S Nishanth K Nithya R	NIL

9	Ms.R.Vanitha	EC8551	Electronic Circuits- I	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	KANCHU LOKESH R.GOKUL S.KRISHNAMOORTHI	NIL
10	Ms.K.Rubitha	EC8352	Signals and Systems	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	M.AFROSE JAMILA K.BALAMURUGAN D.NITHISH	NIL
11	Ms.M.Shyvashankari	EC8392	Digital Electronics	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	D.ANANDHACHANDRU R.JANCY RANI D.NITHISH	NIL
12	Ms.J.Vinitha	EC8691	Microprocessors and microcontroller	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Ayeesha Begum S Vindhiya M Sanjai P	NIL
13	Ms.J.Vinitha	ME8791	Mechatronics	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Dhanush V Hemanth Raj PK Thiruppathi P	NIL
14	Mr.S.Sriram Sundar	CS8351	Digital Principles and system design	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Gayathri S VIMAL SAJUE GR DHIVYA SHREE A	NIL
15	Ms.J.Jeeintha	EC8395	CommunicationEngineering	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	R.BHARATHI S.DINESHKUMAR KARTHIKEYAN S	NIL
16	Mr.R.Saravanan	EC8391	Control System Engineering	UT 2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	KANCHU LOKESH R.GOKUL G.VIGNESHWARAN	NIL
17	Mr.Mahadevan	EC 8393	Fundamentals of Data Structures	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	D.ANANDHACHANDRU R.GOKUL K.BALAMURUGAN	NIL
18	Dr.Lalitha Easwaran	OCY751	Waste Water Treatment	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	SHIFANA BEGUM K DIVAGAR A MOHAMED RIYAS K	NIL
19	Mr.S.Sadeesh	CS8082	Machine Learning Techniques	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	SURIYA S MOHAMED RIYAS K NAGARAJAN P	NIL
20	Mr.S.Maheshwaran	GE8077	Total Quality Management	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Ajaykumar K Citybabu.M Gunasekaran.S	NIL
21	Mr.Sheik Imam	OCE551	Air pollution and control Engineering	UT-2	12		13		NA		15				10		CO-PO sheet verified with ans sheet	Vijei R Adithya.P Citybabu M	NIL

*NA- Not Applicable.

Auditor

IQAC Co-Ordinator

Principal

CYCLE TEST 2 SAMPLE

III - ECE

CARE COLLEGE OF ENGINEERING
TRICHY – 620009

Ⓐ 88 CT-2

INTERNAL ASSESSMENT TEST

Reg. No : 8 1 0 7 1 9 1 0 6 0 0 1

College Code Name	8107 CARE College of Engineering.		
Student Name	ADITHYA.P.	Semester	V
Degree / Branch	B.E / ECE	Date & Session	10.11.2021 FN.
Subject Code	8[illegible]8501	No. of Pages used	9.
Subject Title	Digital Communication		

S. Shakila — Chief Superintendent's Signature / Facsimile

All Particulars given are verified
F. SHAKILA BANU
Name of the Hall Superintendent

Do not write the Register Number, Roll Number, College Code and the Name in any other part of the Answer Book

Put a tick mark (✓) in the applicable Test

UT - I		CT - I		UT - II		CT - II	✓

Instruction to the Candidate. Put (✓) for the questions attended in the tick mark column against each question

						i					ii					iii				Total Marks	Grand Total				
Q	✓	CO	BT	Marks	Q		✓	CO	BT	Marks	✓	CO	BT	Marks	✓	CO	BT	Marks			CO 1	CO 2	CO 3	CO 4	CO 5
1	✓	3	K1	2	8	a																	15.66		
2	✓	2	K2	2		b															CO 6	CO 7	CO 8	CO 9	CO 10
3	✓	4	K2	2	9	a																			
4	✓	4	K2	2		b	✓	3	K4	11										11					
5	✓	4	K2	2	10	a																			
6						b																			
7																									
Total				10															Total	11					

21/30

Declaration by the Examiner: Verified that all the questions attended by the student are valued and the total is found to be correct

11/11/21	M. Shiva Shankari	
Date of Valuation	Name of the Examiner	Signature of the Examiner

No Correction.	P. Adithya.
Statement of student stating all Comments/ Corrections noted	Signature of the Candidate

CARE
COLLEGE OF ENGINEERING
TRICHY – 620009

INTERNAL ASSESSMENT TEST

Reg. No: 8 1 0 7 1 9 1 0 6 0 0 3

College Code Name	8107. care college of engineering	Semester	V
Student Name	K. Ajay Kumar	Date & Session	16/11/21 F.N
Degree / Branch	B.E / ECE	No. of Pages used	12
Subject Code	EC8501		
Subject Title	Digital communication		

Chief Superintendent's Signature / Facsimile

All Particulars given are verified

M. Shiva Shankari

Name of the Hall Superintendent

Do not write the Register Number, Roll Number, College Code and the Name in any other part of the Answer Book

Put a tick mark (✓) in the applicable Test

UT - I		CT - I		UT - II		CT - II	—	Retest

Instruction to the Candidate. Put (✓) for the questions attended in the tick mark column against each question

Q	✓	CO	BT	Marks	Q		✓	CO	BT	Marks	✓	CO	BT	Marks	✓	CO	BT	Marks	Total Marks
							i				ii				iii				
1	✓				8	a	✓												
2	✓					b													
3	✓				9	a													
4	✓					b	✓												
5	✓				10	a													
6						b	✓												
7																			
Total																	Total		

Grand Total				
CO 1	CO 2	CO 3	CO 4	CO 5
CO 6	CO 7	CO 8	CO 9	CO 10

38

Declaration by the Examiner: Verified that all the questions attended by the student are valued and the total is found to be correct

17/11/21	M. Shivashankari	
Date of Valuation	Name of the Examiner	Signature of the Examiner

Statement of student stating all Comments/ Corrections noted	Signature of the Candidate

CARE

COLLEGE OF ENGINEERING

TRICHY – 620009

INTERNAL ASSESSMENT TEST

Reg. No: 8 1 0 7 1 9 1 0 6 0 0 5

College Code Name	8107 / CARE College Of Engineering
Student Name	S. GUNASEKARAN
Degree / Branch	B.E - ECE
Subject Code	EC8501
Subject Title	DIGITAL COMMUNICATION
Semester	V th
Date & Session	16.11.21
No. of Pages used	12

All Particulars given are verified

M. Shivashankari

Name of the Hall Superintendent

Chief Superintendent's Signature / Facsimile

Do not write the Register Number, Roll Number, College Code and the Name in any other part of the Answer Book

Put a tick mark (✓) in the applicable Test: UT - I | CT - I | UT - II | CT - II | Retest

Instruction to the Candidate. Put (✓) for the questions attended in the tick mark column against each question

Q	✓	CO	BT	Marks	Q		✓	CO	BT	Marks	✓	CO	BT	Marks	✓	CO	BT	Marks	Total Marks
				i							ii				iii				
1				2	8	a													
2				2		b				11									11
3				2	9	a													
4				2		b				11									11
5				2	10	a													
6				2		b				12									12
7																			
					11 a														10
Total				10															44

Grand Total

CO 1	CO 2	CO 3	CO 4
CO 6	CO 7	CO 8	CO 9

56

Declaration by the Examiner: Verified that all the questions attended by the student are valued and the total is found to be c

Date of Valuation	Name of the Examiner	Signature of the Exam
17/11/21	M. Shivashankari	

Statement of student stating all Comments/ Corrections noted	Signature of the Candidate

CARE

COLLEGE OF ENGINEERING

(Approved by AICTE and Affiliated to Anna University, Chennai)

27, Thayanur, Trichy – 620009

INTERNAL QUALITY ASSURANCE CELL [IQAC]

Answer Paper Audit Format

S.No.	Faculty Name	Course Code	Course Name	UT (I-II) / CT (I-II) / Model	Part-A		Part-B		Part-C		MCQ		Assignment		Seminar/other Activities		Status	Audited Answer sheet students Name	Corrections
					Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Attendance	Evaluated Mark			
1	Ms.R.Deepalakshmi	EC8791	Embedded and Real Time Systems	CT-2	10	3 10 10	26	4 12 27	NA		10				10		CO-PO sheet verified with ans sheet	S.Jayaprasad M Gopinath K.Shafana Begum	CO Grand total to be added
2	Ms.R.Vanitha	EC8701	Antennas and Microwave Engineering	CT-2	10	8 14 9	26	0 2 25	NA		10				10		CO-PO sheet verified with ans sheet	S.Jayaprasad M Gopinath K.Shafana Begum	BTL level to be filled
3	Mr.S.Sriram Sundar	EC8751	Optical Communication	CT-2	10	6 4 6	26	38 3 26	NA	NA	10				10		CO-PO sheet verified with ans sheet	K.Shifana Begum Jayaprasad Lakshmi Priya	To be awarded marks inside
4	Dr.J.Jeyarani	EC8702	Ad hoc and Wireless Sensor Networks	CT-2	10	2 4 0	26	10 22 12			10				10		CO-PO sheet verified with ans sheet	P.Nagarajan S.Jayaprasad M Gopinath	BTL level to be filled
5	Ms.M.Shiva shankari	EC8501	Digital Communication	CT-2	10	10 0	26	11 0			10				10		CO-PO sheet verified with ans sheet	K.Ajay Kumar P.Adithya	absentees retest followup

6	Ms.K.Rubitha	EC8553	Discrete-Time Signal Processing	CT-2	10	4 6 7	26	9 23 30			10				10		CO-PO sheet verified with ans sheet	M.Citybabu S.Gunasekaran S.Rajarajeswari	nil
7	Ms.J.Jecintha	EC8552	Computer Architecture and Organization	CT-2	10	2 0 8	26	0 11 18			10				10		CO-PO sheet verified with ans sheet	S.Dhanakaran R.Vijai S.Rajarajeswari	CO Grand total to be added
8	Ms.R.Deepalakshmi	EC8551	Communication Networks	CT-2	10	1 1 10	26	17 21 23			10				10		CO-PO sheet verified with ans sheet	K.Ajay Kumar R.Vijai P.Adithya	nil
9	Ms.R.Vanitha	EC8351	Electronic Circuits- I	CT-2	10	6 6 6	26	0 2 13			10				10		CO-PO sheet verified with ans sheet	G.Vigneshwaran K.Balamurugan Gadireddy Sameera	marks to be graded aside
10	Ms.K.Rubitha	EC8352	Signals and Systems	CT-2	10	3 7 9	26	10 10 25			10				10		CO-PO sheet verified with ans sheet	G.Vigneshwaran S.Krishnamoorthi K.Balamurugan	nil
11	Ms.M.Shivashankari	EC8392	Digital Electronics	CT-2	10	7 8 6	26	0 7 19			10				10		CO-PO sheet verified with ans sheet	G.Vigneshwaran R.Gokul K.Balamurugan	CO Grand total to be added
12	Ms.J.Vinitha	EC8691	Microprocessors and microcontroller	CT-2	10		26				10				10		CO-PO sheet verified with ans sheet	R.Nithin Karthick Chelci Jisha R.Nithya	CO Grand total to be added

14	Mr.S.Sriram Sundar	CS8351	Digital Principles and system design	CT-2	10	9 1 9	26	16 0 5			10				10		CO-PO sheet verified with ans sheet	J.Aanto Lokesh G Madan.M	nil
15	Ms.J.Jecintha	EC8395	Communication Engineering	CT-2	10	3 7 8	26	0 13 20			10				10		CO-PO sheet verified with ans sheet	S.Navin V.Pavika R.Bharathi	CO Grand total to be added
16	Mr.R.Saravanan	EC8391	Control System Engineering	CT-2	10		26				10				10		CO-PO sheet verified with ans sheet	KANCHU LOKESH R.JANCY RANI GADIREDDY SAMEERA	CO Grand total to be added
17	Mr.Mahadevan	EC 8393	Fundamentals of Data Structures	CT-2	10		26				10				10		CO-PO sheet verified with ans sheet	G.Vigneshwaran K.Balamurugan Nithish	CO Grand total to be added
18	Dr Lalitha Easwaran	OCY751	Waste Water Treatment	CT-2	10		26				10				10		CO-PO sheet verified with ans sheet	Lakshmi Priya Surya Balakrishnan	CO Grand total to be added
19	Dr.A.Pasumpon Pandian	CS8082	Machine Learning Techniques	CT-2	10		26				10				10		CO-PO sheet verified with ans sheet	Gopinath Nagarajan Jayaprasad	CO Grand total to be added
20	Mr.S.Maheshwaran	GE8077	Total Quality Management	CT-2	10		26				10				10		CO-PO sheet verified with ans sheet	M.Citybabu S.Gunasekaran S.Rajarajeswari	Signature missing
21	Mr.Sheik Imam	OCE551	Air pollution and control Engineering	CT-2	10		26				10				10		Not available	Not available	NOTED

*NA- Not Applicable

Auditor

IQAC Co-Ordinator

Principal

MODEL 1 SAMPLE

CARE
COLLEGE OF ENGINEERING
TRICHY – 620009

(A)

MODEL EXAMINATION

Model-1

Reg. No: 8 1 0 7 1 9 1 0 6 0 0 1

College Code Name	8107 / CARE College of Engineering
Student Name	ADITHYA. P.
Degree / Branch	B.E / ECE
Subject Code	EC8501
Subject Title	Digital Communication.
Semester	7
Date & Session	30.11.2021. AN.
No. of Pages used	

S. Bharath
Chief Superintendent's Signature/ Facsimile

All Particulars given are verified
B. Sudha Priya 30/11/21
B. SUDHA PRIYA
Name of the Hall Superintendent

Do not write the Register Number, Roll Number, College Code and the Name in any other part of the Answer Book
Instruction to the Candidate. Put (✓) for the questions attended in the tick mark column against each question

Q	✓	CO	BT	Marks
1	✓	1	K1	2
2	✓	1	K1	2
3	✓	2	K2	2
4	✓	2	K2	2
5	✓	3	K2	2
6				
7	✓	4	K1	2
8	✓	4	K2	2
9				
10	✓	5	K1	2
Total				16

Q		✓	CO	BT	Marks
11	a				
	b	✓	1	K3	12
12	a	✓	2	K2	11
	b				
13	a				
	b	✓	3	K2	10
14	a				
	b	✓	4	K2	11
15	a				
	b	✓	5	K3	2
16	a	✓	4	K3	15
	b				
Total					61

Q	✓	CO	BT	Marks

Q	✓	CO	BT	Marks

Total Marks
12
11
10
11
2
15
61

Grand Total				
CO 1	CO 2	CO 3	CO 4	CO 5
16	15	13	30	6
CO 6	CO 7	CO 8	CO 9	CO 10

Seven seven

77/100

Declaration by the Examiner: Verified that all the questions attended by the student are valued and the total is found to be correct

Date of Valuation	Name of the Examiner	Signature of the Examiner
1/12/21	M. Shiva Shankari	

Statement of student stating all Comments/ Corrections noted	Signature of the Candidate
Noted.	P. Adithya.

CARE
COLLEGE OF ENGINEERING
TRICHY – 620009

(A) Model-1

MODEL EXAMINATION

Reg. No : 8 1 0 7 1 9 1 0 6 0 0 3

College Code Name	8107 . care college of engineering		
Student Name	City babu M.		
Degree / Branch	B.E ~~E&E~~ ECE	Semester	V
Subject Code	EC8501	Date & Session	26.11.21 · A.N
Subject Title	Digital communication	No. of Pages used	20

S. Thanj
Chief Superintendent's Signature/ Facsimile

All Particulars given are verified
B. Sudha 29/11/21
B. SUDHA PRIYA
Name of the Hall Superintendent

Do not write the Register Number, Roll Number, College Code and the Name in any other part of the Answer Book
Instruction to the Candidate. Put (✓) for the questions attended in the tick mark column against each question

Q	✓	CO	BT	Marks	Q		i ✓	i CO	i BT	i Marks	ii ✓	ii CO	ii BT	ii Marks	iii ✓	iii CO	iii BT	iii Marks	Total Marks
1					11	a	✓	1	K3	09									09
2	✓	1	K1	02		b													
3					12	a	✓	2	K2	07									07
4						b													
5	✓	3	K1	01	13	a	✓	3	K2	8									05
6						b													
7					14	a													
8						b	✓	4	K2	8									08
9					15	a													
10						b													
					16	a				2									
						b	✓	5	K3	6									6
Total				03														Total	31

CO 1	CO 2	CO 3	CO 4	CO 5
11	7	06	8	6
CO 6	CO 7	CO 8	CO 9	CO 10

Grand Total

Three four

34/100

Declaration by the Examiner: Verified that all the questions attended by the student are valued and the total is found to be correct

Date of Valuation	Name of the Examiner	Signature of the Examiner
1/12/21	M. Shiva Shankari	

Statement of student stating all Comments/ Corrections noted	Signature of the Candidate

CARE
COLLEGE OF ENGINEERING
TRICHY – 620009

MODEL EXAMINATION

Model-1

Reg. No : 8 1 0 7 1 9 1 0 6 0 0 2

College Code Name	8107/CARE COLLEGE OF ENGINEERING		
Student Name	K. Asvin Kumar		
Degree / Branch	BE – ECE	Semester	V
Subject Code	EC8501	Date & Session	26/11/21/AN
Subject Title	DIGITAL COMMUNICATION	No. of Pages used	11

S. Shanthi
Chief Superintendent's Signature/ Facsimile

All Particulars given are verified
30/11/21

B. SUDHA PRIYA
Name of the Hall Superintendent

Do not write the Register Number, Roll Number, College Code and the Name in any other part of the Answer Book
Instruction to the Candidate. Put (✓) for the questions attended in the tick mark column against each question

Q	✓	CO	BT	Marks	Q		✓	CO	BT	Marks	✓	CO	BT	Marks	✓	CO	BT	Marks	Total Marks
		i					ii				iii								
1	✓	1	K1	0	11	a													
2	✓	1	K1	01		b													
3					12	a	✓	2	K2	5									5
4						b													
5					13	a													
6						b													
7					14	a													
8	✓	4	K2	0		b	✓	4	K2	01									01
9					15	a													
10						b													
					16	a													
						b													
Total				01														Total	06

CO 1	CO 2	CO 3	CO 4	CO 5
0	06	0	01	0
CO 6	CO 7	CO 8	CO 9	CO 10

Have Seen

07/100

Declaration by the Examiner: Verified that all the questions attended by the student are valued and the total is found to be correct

Date of Valuation	Name of the Examiner	Signature of the Examiner
1/12/21	M. Shiva Shankari	

Statement of student stating all Comments/ Corrections noted	Signature of the Candidate

CARE
COLLEGE OF ENGINEERING
(Approved by AICTE and Affiliated to Anna University, Chennai)
27, Thuvakudi, Trichy - 620009

INTERNAL QUALITY ASSURANCE CELL (IQAC)
Answer Paper Audit Format

Department: ECE | Auditor: Mr.Shiva Shankari /ECE

S.No.	Faculty Name	Course Code	Course Name	UT (I-II) / CT (I-II) / Model	Part-A		Part-B		Part-C		MCQ		Assignment		Seminar/other Activities		Status	Audited Answer sheet students name	Corrections
					Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Qns/ Allotted Mark	Evaluated Mark	Attendance	Evaluated Mark			
1	Ms.R.Deepalakshmi	EC8791	Embedded and Real Time Systems	Model		4		17		6	NA		NA		NA		CO-PO sheet verified with ans sheet	Mohamed Riyas	
						0		12		4								P Nagarajan	
					20	0	65	0	15	1								P.Keerthick roshan	
2	Ms.R.Vanitha	EC8701	Antennas and Microwave Engineering	Model	20	14	65	24	15	15	NA		NA		NA		CO-PO sheet verified with ans sheet	K.Shifana Begam	Grand total for 20 to be added
						12		35		3								R.Bhakkiya	
						1		5		0								P.Nagarajan	
3	Mr.S.Sriram Sundar	EC8251	Optical Communication	Model	20	2	65	16	15	12	NA		NA		NA		CO-PO sheet verified with ans sheet	Mohamed Riyas K	
						4		10		13								P.Nagarajan	
						5		28		14								Devasar.A	
4	Dr.J.Jeyarani	EC8702	Ad hoc and Wireless Sensor Networks	Model	20		65		15		NA		NA		NA		CO-PO sheet verified with ans sheet	Mohamed Riyas K N.Lakshmi priya P.Nagarajan	
5	Ms.M.ShivaShankari	EC8501	Digital Communication	Model	20	16	65	46	15	15	NA		NA	NA	NA		CO-PO sheet verified with ans sheet	Adithya P	
						3		29		6								M.Gokulbabu	
						1		6		0			10					K.Ajaykumar	Assignment marks can be given
6	Ms.K.Rubitha	EC8553	Discrete-Time Signal Processing	Model	11	14	65	46	15	14	NA		NA		NA		CO-PO sheet verified with ans sheet	S.Rajeshwari	
					6			16		0								M.Gokulbabu	
					20			65		15								S.Gunasekaran	
7	Ms.J.Jeeintha	EC8552	Computer Architecture and Organization	Model	20	18	65	40	15	14	NA		NA		NA		CO-PO sheet verified with ans sheet	Adithya P	
						9		30		11								S.Gunasekaran	
						2		9		6									
8	Ms.R.Deepalakshmi	EC8351	Communication Networks	Model	20	18	65	34	15	14	NA		NA		NA		CO-PO sheet verified with ans sheet	Adithya P	
						8		28		14								K.Ajaykumar	
						3		0		7								S.Dhanakarn	
9	Ms.R.Vanitha	EC8351	Electronic Circuits-I	Model	20	12	65	34	15	9	NA		NA		NA		CO-PO sheet verified with ans sheet	K.Balamurugan	
						18		16		11								Kanchalakshi	
						7		5		1								Dinesh Kumar M	
10	Ms.K.Rubitha	EC8352	Signals and Systems	Model	20	16	65	51	15	8	NA		NA		NA		CO-PO sheet verified with ans sheet	K.Balamurugan	
						5		40		7								Kavitamoorthi S	
						3		17		0								Kanchalakshi	
11	Ms.M.Shivashankari	EC8392	Digital Electronics	Model	20	15	65	56	15	12	NA		NA		NA		CO-PO sheet verified with ans sheet	K.Balamurugan	
						17		26		8								Kanchalakshi	
						4		1		0								Dinesh Kumar M	

12	Ms.J Vinitha	EC869	Microprocessors and microcontroller	Model	20		65		15		NA		NA		NA		CO PO sheet verified with ans sheet	S Ayesha Begum D M Keerthana S A Ramchandar	
13	Mr.S Sriram Sundar	CS835	Digital Principles and system design	Model	20	9 7 1	65	39 23 1	15	8 2 0	NA		NA 10	NA	NA		CO-PO sheet verified with ans sheet	Pavika V Vimal Sajee GR R.Kaviyan	 Assignment marks can be given
14	Ms.J Jeevitha	EC8395	Communication Engineering	Model	20	19 8 5	60	37 40 30	15	11 2 0	NA		NA 10	NA	NA		CO-PO sheet verified with ans sheet	Akrita J Gayathri S Pasupuleti Dheeraj	 Assignment marks can be given
15	Mr.R Saravanan	EC8391	Control System Engineering	Model	20		60		15		NA		NA		NA		CO-PO sheet verified with ans sheet	Kanchu Lokesh Visweshwaran G Dinesh Kumar M	
16	Mr.Mahadevan	EC8393	Fundamentals of Data Structures	Model	20		65		15		NA		NA		NA		CO-PO sheet verified with ans sheet	Balamurugan K Janey Rani R Afreen Jamila M	Grand total for co to be added
17	Dr. Lalitha Bhaskaran	OCE751	Waste Water Treatment	Model	20		65		15		NA		NA		NA		CO-PO sheet verified with ans sheet	BHAKKIYA R LAKSHMI PRIYA N MOHAMED RIYAS K	
18	Mr.Sadesh	CS8082	Machine Learning Techniques	Model	20		65		15		NA		NA		NA		CO-PO sheet verified with ans sheet	SHIFANA BEGUM K SURIYA S NAGARAJAN P	
19	Mr.S.Maheshwaran	OEB073	Total Quality Management	Model	20		65		15		NA		NA		NA		CO-PO sheet verified with ans sheet	S Rajarajeswari K.Ajaykumar S.Dhanalakshmi	
20	Mr.Shaik Imam	OCE551	Air pollution and control Engineering	Model	20		65		15		NA		NA		NA		CO-PO sheet verified with ans sheet	Aditya.P S.Gunasekaran K.Vijay	

*NA - Not Applicable.

Auditor

KIAC Co-Ordinator

Principal

CARE
COLLEGE OF ENGINEERING

(Approved by AICTE and Affiliated to Anna University, Chennai)
27, Thayanur, Trichy – 620009

Department of Electronics and Communication Engineering

Course End Survey

Branch: ECE Semester: V Sem

Course Code & Name: EC 8502 – Digital Communication

Faculty In-charge: M. Shiva Shankari Academic Year: 2021-22, ODD

S. No.	Course Outcome	Excellent (3)	Good (2)	Satisfactory (1)	Assessed Marks
1	To Design PCM systems	3			3
2	To Design and implement base band transmission schemes	3			3
3	To Design and implement band pass signaling schemes		2		2
4	To Analyze the spectral characteristics of band pass signaling schemes and their noise performance	3			3
5	To Design error control coding schemes	3			3

Date: 30.11.2021

J. Jeyaci

HOD

CO PO ATTAINMENT SHEET

CARE COLLEGE OF ENGINEERING, TRICHY

DEPARTMENT :ECE

Unit Test I and Cycle Test I Analysis

R2017: COURSE CODE & NAME: DIGITAL COMMUNICATION

FACULTY NAME: M.Shiva Shankari

QUESTION SECTION			UT-I :: PART A						UT-I :: PART B							CT-1::PART A							CT-I :: PART B															Others			
QUESTION NUMBER			Q1	Q2	Q3	Q4	Q5	Q6	Q7 (a) (i)	Q7 (a) (ii)	Q7 (a) (iii)	Q7 (b) (i)	Q7 (b) (ii)	Others	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8 (a) (i)	Q8 (a) (ii)	Q8 (a) (iii)	Q8 (b) (i)	Q8 (b) (ii)	Q8 (b) (iii)	Q9 (a) (i)	Q9 (a) (ii)	Q9 (a) (iii)	Q9 (b) (i)	Q9 (b) (ii)	Others	Assignment/ Aptitude Test/ Seminar/ Quiz/ Mini Projects	Total UT1	Total CT1	Total
ALLOTTEDTED MARKS			2	2	2	2	2	2	13			13		25	2	2	2	2	2	2	2	13			13			13			13			20	100	100	100
COURSE OUTCOME			1	1	1	1	1	1	1			1		1	1	1	1	2	2	2	2	1			1			2			2			2	35%	65%	
BT LEVELS [R,U,AP,AN,E,C]			R	U	U	AP	R	R	AP			U		R	R	U	U	U	U	R	R	AP			AP			AP			AP			U			
S.No	Reg Number	STUDENT NAME																																						
1	810719106001	Adithya P	2	2	1	2	2	2	13					24	2	2	2	2	2	0	2				12						12			19	120	72	89
2	810719106002	Ajay Kumar K	0	2	1	2	2	2	13					22	2	2	2	0	0	2	2				11						11			17	110	64	80
3	810719106003	Citybabu M	1	2	1	2	1	1	13					9	2	2	2	0	0	2	2				11						9			13	75	60	65
4	810719106004	Dhinakaran S	0	2	1	2	2	1	10					25	2	2	2	0	0	2	1				10						0			16	108	38	62
5	810719106005	Gunasekaran S	0	2	1	2	2	0	10					23	2	2	2	0	0	2	2				11						11			19	100	64	77
6	810719106006	Nishanth K	2	2	2	2	2	2	0					17	2	2	2	0	2	2	2				11						11			18	73	68	70
7	810719106007	Nithya R	0	2	1	2	2	2	9					25	0	0	2	0	2	0	0				10						8			12	108	44	66
8	810719106008	Raja Rajeswari S	2	2	1	2	2	2	13					25	2	2	2	2	2	2	2				12						12			20	123	76	92
9	810719106009	Vijei R	2	2	1	2	2	2	10					24	2	0	2	2	0	2	2				11						10			17	113	62	80
			CO						CO						CO							CO						CO						CO			
		CO NUMBER	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6
		BT LEVELS	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E

FACULTY

HOD

CARE COLLEGE OF ENGINEERING, TRICHY

DEPARTMENT : ECE

Unit Test I and Cycle Test I ANALYSIS

R2017: COURSE CODE & NAME:EC 8501 DIGITAL COMMUNICATION

FACULTY NAME: M.Shiva Shankari

QUESTION SECTION			CO1									CO2									CO3									CO4									CO5									CO9		
BT LEVELS [R,U,AP,AN,E,C]			R	U	AP	AN	E	C	SCORED	ALLOTTE	TARGET	R	U	AP	AN	E	C	SCORED	ALLOTTE	TARGET	R	U	AP	AN	E	C	SCORED	ALLOTTE	TARGET	R	U	AP	AN	E	C	SCORED	ALLOTTE	TARGET	R	U	AP	AN	E	C	SCORED	ALLOTTE	TARGET	ALLOTTE	TARGET	TOTAL
S.No	Reg Number	STUDENT NAME																																															
1	810719106001	Adithya P	32	7	27	0	0	0	66	69	96	2	23	12	0	0	0	37	41	90	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	##	##	##
2	810719106002	Ajay Kumar K	28	7	26	0	0	0	61	69	88	4	17	11	0	0	0	32	41	78	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	##	##	93
3	810719106003	Citybabu M	14	7	26	0	0	0	47	69	68	4	13	9	0	0	0	26	41	63	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	##	##	73
4	810719106004	Dhinakaran S	30	7	22	0	0	0	59	69	86	3	16	0	0	0	0	19	41	46	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	##	##	78
5	810719106005	Gunasekaran S	27	7	23	0	0	0	57	69	83	4	19	11	0	0	0	34	41	83	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	##	##	91
6	810719106006	Nishanth K	25	8	13	0	0	0	46	69	67	4	20	11	0	0	0	35	41	85	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	##	##	81
7	810719106007	Nithya R	29	5	21	0	0	0	55	69	80	0	14	8	0	0	0	22	41	54	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	##	##	77
8	810719106008	Raja Rajeswari S	33	7	27	0	0	0	67	69	97	4	24	12	0	0	0	40	41	98	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	##	##	##
9	810719106009	Vijei R	32	5	23	0	0	0	60	69	87	4	19	10	0	0	0	33	41	80	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	0	0	0	0	0	0	0	0	##	##	##	93
No of Students Attended			0	0	0	0	0	0	9	9	9	9	9	9	9	9	9	9	9	9	0	0	0	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	

ATTAINMENT LEVEL :	60								
CO	1	2	3	4	5	6	7	8	9
Attainment %	##	78	0	0	0	0	0	0	0

L1	60% STUDENTS SCORING MORE THAN SET TARGET (CLASS AVERA
L2	70% STUDENTS SCORING MORE THAN SET TARGET (CLASS AVERAGE / PERCENTAGE)
L3	80% STUDENTS SCORING MORE THAN SET TARGET (CLASS AVERAGE / PERCENTAGE)

Course Outcomes	Attainment	Attainment
CO1	100	3
CO2	78	2
CO3	0	0
CO4	0	0
CO5	0	0

Shiva Shankari M

FACULTY

J. Jayasri

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CARE COLLEGE OF ENGINEERING, TRICHY

DEPARTMENT :ECE

Unit Test II and Cycle Test II Analysis

R2017: COURSE CODE & NAME: EC 8501 Digital Communication

FACULTY NAME: M.Shiva Shankari

QUESTION SECTION			UT-II :: PART A						UT-II :: PART B						CT-II :: PART A							CT-II :: PART B									
QUESTION NUMBER			Q1	Q2	Q3	Q4	Q5	Q6	Q7 (a)	Q7 (a)	(a)	Q7 (b)	Q7 (b)	Others	Q1	Q2	Q3	Q4	Q5			6(a)		7(a)		8(a)		8(b)	Assignment/ Aptitude	Total	Total	Total
ALLOTTEDTED MARKS			2	2	2	2	2	2	13			7	6	25	2	2	2	2	2			13		13		14		14		100	100	100
COURSE OUTCOME			3	3	3	3	3	3	3			3	3	3	3	3	4	4	4			3		3		4		4		35%	45%	
BT LEVELS [R,U,AP,AN,E,C]			U	R	R	R	U	R	AP			AP	AP	U	R	U	U	U	U			AP		AP		U		U				
S.No	Reg Number	STUDENT NAME																														
1	810719106001	Adithya P	2	0	0	0	0	2				6	0	23	2	2	2	2	2									11		83	42	56
2	810719106002	Ajay Kumar K	2	2	2	2	0	0	9					23	2	2	2	0	1					10				11		100	56	71
3	810719106003	Citybabu M	2	2	2	2	0	0	9					22	1	0	0	1	1					8				6		98	34	56
4	810719106004	Dhinakaran S	2	2	2	2	2	0	8					9	2	2						6								68	20	37
5	810719106005	Gunasekaran S	2	2	2	2	2	0	9					22	2	2	2	2				11						9		103	56	72
6	810719106006	Nishanth K	2	0	2	1	2	0	4					23	2	2			2					9						85	30	49
7	810719106007	Nithya R	0	0	2	0	0	0	0					12	2	2						5								35	18	24
8	810719106008	Raja Rajeswari S	2	2	2	2	1	2	9					23	2	2	2	2	2					10				10		108	60	77
9	810719106009	Vijei R	2	2	2	2	1	2	0					23	2	2	2	1				11						9		85	54	65
			CO						CO						CO							CO					CO					
		CO NUMBER	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	6	6	6	6
		BT LEVELS	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	U	AP	AN	E

Shiva Shankari

FACULTY

J. Jeyarani

HOD

CARE COLLEGE OF ENGINEERING, TRICHY

DEPARTMENT : ECE

Unit Test II and Cycle Test II Analysis

R2017: COURSE CODE & NAME: EC 8501 DIGITAL COMMUNICATION

FACULTY NAME:M.Shiva Shankari

QUESTION SECTION			CO1									CO2									CO3									CO4									CO5										
BT LEVELS [R,U,AP,AN,E,C]			R	U	AP	A	E	C	SC	AL	IA	R	U	AP	AN	E	C	SC	OR	AL	IA	RG	R	U	AP	AN	E	C	SC	OR	AL	IA	RG	R	U	AP	AN	E	C	SC	OR	AL	IA	RG	IA	RG	TOTAL
S.No.	Reg Number	STUDENT NAME																																													
1	810719106001	Adithya P	0	0	0	0	0	0	0	0	###	0	0	0	0	0	0	0	0	#	4	#	6	0	0	0	#	#	#	0	#	0	0	0	0	#	#	#	0	0	0	0	0	0	0	0	#	#	#
2	810719106002	Ajay Kumar K	0	0	0	0	0	0	0	0	###	0	0	0	0	0	0	0	0	#	8	#	#	0	0	0	#	#	#	0	#	0	0	0	0	#	#	#	0	0	0	0	0	0	0	0	#	#	#
3	810719106003	Citybabu M	0	0	0	0	0	0	0	0	###	0	0	0	0	0	0	0	0	#	7	#	#	0	0	0	#	#	#	0	8	0	0	0	0	8	#	#	0	0	0	0	0	0	0	0	#	#	#
4	810719106004	Dhinakaran S	0	0	0	0	0	0	0	0	###	0	0	0	0	0	0	0	0	#	8	#	#	0	0	0	#	#	#	0	0	0	0	0	0	0	0	#	0	0	0	0	0	0	0	0	#	#	#
5	810719106005	Gunasekaran S	0	0	0	0	0	0	0	0	###	0	0	0	0	0	0	0	0	#	8	#	#	0	0	0	#	#	#	0	#	0	0	0	0	#	#	#	0	0	0	0	0	0	0	0	#	#	#
6	810719106006	Nishanth K	0	0	0	0	0	0	0	0	###	0	0	0	0	0	0	0	0	#	5	#	#	0	0	0	#	#	#	0	2	0	0	0	0	2	2	#	0	0	0	0	0	0	0	0	#	#	#
7	810719106007	Nithya R	0	0	0	0	0	0	0	0	###	0	0	0	0	0	0	0	0	#	4	#	5	0	0	0	#	#	#	0	0	0	0	0	0	0	0	#	0	0	0	0	0	0	0	0	#	#	#
8	810719106008	Raja Rajeswari S	0	0	0	0	0	0	0	0	###	0	0	0	0	0	0	0	0	#	#	#	#	0	0	0	#	#	#	0	#	0	0	0	0	#	#	#	0	0	0	0	0	0	0	0	#	#	#
9	810719106009	Vijei R	0	0	0	0	0	0	0	0	###	0	0	0	0	0	0	0	0	#	#	#	#	0	0	0	#	#	#	0	#	0	0	0	0	#	#	#	0	0	0	0	0	0	0	0	#	#	#
No of Students Attended			9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	

ATTAINMENT LEVEL :	60

CO	1	2	3	4	5	6	7	8	9
Attainment %	0	0	#	#	0	0	0	0	0

Course Outcomes	Attainment	Attain
CO1	0	0.1
CO2	0	0.1
CO3	78	2
CO4	67	1
CO5	0	0.1

L1	60% STUDENTS SCORING MORE THAN SET TARGET (CLA
L2	70% STUDENTS SCORING MORE THAN SET TARGET (CLASS AVERAGE / PERCENTAGE)
L3	80% STUDENTS SCORING MORE THAN SET TARGET (CLASS AVERAGE / PERCENTAGE)

Shiva Shankari
FACULTY

J. Jayasri
HOD

CARE COLLEGE OF ENGINEERING, TRICHY

DEPARTMENT : ECE

Model Exam Analysis

R2017: COURSE CODE & NAME:EC 8501 DIGITAL COMMUNICATION

FACULTY NAME: M.Shiva Shankari

QUESTION SECTION			M1 - PART A										M1 - PART B																														M1 - PART C								
QUESTION NUMBER			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11 (a) (i)	Q11 (a) (ii)	Q11 (a) (iii)	Q11 (b) (i)	Q11 (b) (ii)	Q11 (b) (iii)	Q12 (a) (i)	Q12 (a) (ii)	Q12 (a) (iii)	Q12 (b) (i)	Q12 (b) (ii)	Q12 (b) (iii)	Q13 (a) (i)	Q13 (a) (ii)	Q13 (a) (iii)	Q13 (b) (i)	Q13 (b) (ii)	Q13 (b) (iii)	Q14 (a) (i)	Q14 (a) (ii)	Q14 (a) (iii)	Q14 (b) (i)	Q14 (b) (ii)	Q14 (b) (iii)	Q15 (a) (i)	Q15 (a) (ii)	Q15 (a) (iii)	Q15 (b) (i)	Q15 (b) (ii)	Q15 (b) (iii)	Q16 (a) (i)	Q16 (a) (ii)	Q16 (a) (iii)	Q16 (b) (i)	Q16 (b) (ii)	Q16 (b) (iii)	Assign ment/ Aptitu de Test/ Semina r/ Quiz/	TOTAL MODEL	Total
ALLOTTEDTED MARKS			2	2	2	2	2	2	2	2	2	2	13			13			13			13			13			13			13			13			13			13			15			15				100	100
COURSE OUTCOME			1	1	2	2	3	3	4	4	5	5	1			1			2			2			3			3			4			4			5			5			4			5					
BT LEVELS [R,U,AP,AN,E,C]			R	R	U	U	R	R	U	U	U	R	AP			AP			U			U			U			U			U			U			AP			AP			AP			AP					
S.No	Reg Number	STUDENT NAME																																																	
1	810719106001	Adithya P	2	2	2	2	2	2	2	2	2	2	13									12			11									13						12			12							93	70
2	810719106002	Ajay Kumar K	1	2	0	1	2	0	1	1	0	0				10						11			8									4			11									11				63	47
3	810719106003	Citybabu M	0	2	0	1	2	2	1	0	0	0				11						10			8									9			10									10				66	50
4	810719106004	Dhinakaran S				2							0			2																					4									2				10	8
5	810719106005	Gunasekaran S	2	2	2	2	2	2	1	2	2	2				11						10			9									11			11									12				83	62
6	810719106006	Nishanth K				2																8			7									10			11									13				51	38
7	810719106007	Nithya R														4						5			7												4									2				22	17
8	810719106008	Raja Rajeswari S	2			2	2		2	2	2	2				11						11			9									12			11									11				79	59
9	810719106009	Vijei R	2			2					0	0				2						9			10												12									12				49	37
			CO						CO						CO						CO						CO						CO						CO						CO							CO
		CO NUMBER	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7	7	7	8	8	8	8	8	8	9
		BT LEVELS	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R	U	AP	AN	E	C	R

Shiva Shankari
FACULTY

J. Jeyarani
HOD

CARE COLLEGE OF ENGINEERING, TRICHY

DEPARTMENT : ECE

MODEL EXAM ANALYSIS

R2017: COURSE CODE & NAME: EC 8501 DIGITAL COMMUNICATION

FACULTY NAME: M.Shiva Shankari

QUESTION SECTION			CO1										CO2										CO3										CO4										CO5										TOTAL
BT LEVELS [R,U,AP,AN,E,C]			R	U	AP	AN	E	C	SCORE	ALL OT	TA	RG	R	U	AP	AN	E	C	SCORE	ALL OT	TA	RG	R	U	AP	AN	E	C	SCORE	ALL OT	TA	RG	R	U	AP	AN	E	C	SCORE	ALL OT	TA	RG	R	U	AP	AN	E	C	SCORE	ALL OT	TA	RG	
S.No.	Reg Number	STUDENT NAME																																																		
1	810719106001	Adithya P	4	0	13	0	0	0	17	17	##		0	16	0	0	0	0	16	17	94		4	11	0	0	0	0	15	17	88		0	17	12	0	0	0	29	32	91		2	2	12	0	0	0	16	17	94		41
2	810719106002	Ajay Kumar K	3	0	10	0	0	0	13	17	76		0	12	0	0	0	0	12	17	71		2	8	0	0	0	0	10	17	59		0	6	0	0	0	0	6	17	35		0	0	22	0	0	0	22	32	69		28
3	810719106003	Citybabu M	2	0	11	0	0	0	13	17	76		0	11	0	0	0	0	11	17	65		4	8	0	0	0	0	12	17	71		0	10	0	0	0	0	10	17	59		0	0	20	0	0	0	20	32	63		29
4	810719106004	Dhinakaran S	0	0	2	0	0	0	2	26	8		0	2	0	0	0	0	2	2	##		0	0	0	0	0	0	0	0	##		0	0	0	0	0	0	0	0	##		0	0	6	0	0	0	6	28	21		4
5	810719106005	Gunasekaran S	4	0	11	0	0	0	15	17	88		0	14	0	0	0	0	14	17	82		4	9	0	0	0	0	13	17	76		0	14	0	0	0	0	14	17	82		2	2	23	0	0	0	27	32	84		37
6	810719106006	Nishanth K	0	0	0	0	0	0	0	0	##		0	10	0	0	0	0	10	15	67		0	7	0	0	0	0	7	13	54		0	10	0	0	0	0	10	13	77		0	0	24	0	0	0	24	28	86		23
7	810719106007	Nithya R	0	0	4	0	0	0	4	13	31		0	5	0	0	0	0	5	13	38		0	7	0	0	0	0	7	13	54		0	0	0	0	0	0	0	0	##		0	0	6	0	0	0	6	28	21		10
8	810719106008	Raja Rajeswari S	2	0	11	0	0	0	13	15	87		0	13	0	0	0	0	13	15	87		2	9	0	0	0	0	11	15	73		0	16	0	0	0	0	16	17	94		2	2	22	0	0	0	26	32	81		35
9	810719106009	Vijei R	2	0	2	0	0	0	4	15	27		0	11	0	0	0	0	11	15	73		0	10	0	0	0	0	10	13	77		0	0	0	0	0	0	0	0	##		0	0	24	0	0	0	24	32	75		22
No of Students Attended			9	9	9	9	9	9	9	9	9		9	9	9	9	9	9	9	9	9		9	9	9	9	9	9	9	9	9		9	9	9	9	9	9	9	9	9		9	9	9	9	9	9	9	9	9		

ATTAINMENT LEVEL :	60								
CO	1	2	3	4	5	6	7	8	9
Attainment %	56	89	56	44	78	0	0	0	0

L1	60% STUDENTS SCORING MORE THAN SET TARGET (CLASS AVERAGE / PE
L2	70% STUDENTS SCORING MORE THAN SET TARGET (CLASS AVERAGE / PERCENTAGE)
L3	80% STUDENTS SCORING MORE THAN SET TARGET (CLASS AVERAGE / PERCENTAGE)

Course Outcomes	Attainment	Attainment
CO1	56	0.1
CO2	89	3
CO3	56	0.1
CO4	44	0.1
CO5	78	2

Shiva Shankari

FACULTY

J. Jayasi

HOD/ECE

CARE COLLEGE OF ENGINEERING, TRICHY			
DEPARTMENT : Electronics and Communication Engineering			
END SEMESTER RESULT ANALYSIS			
R2017: COURSE CODE & NAME: EC8501 Digital Communication			
FACULTY NAME: Mrs.M.ShivaShankari			
ATTAINMENT LEVEL			60
ALLOTED MARKS			100
S.No	Reg Number	STUDENT NAME	GRADE
1	810719106001	Adithya P	A
2	810719106002	Ajay Kumar K	A
3	810719106003	Citybabu M	U
4	810719106004	Dhinakaran S	A
5	810719106005	Gunasekaran S	A
6	810719106006	Nishanth K	A
7	810719106007	Nithya R	A
8	810719106008	Raja Rajeswari S	A
9	810719106009	Vijei R	A

O	100	0
A+	90	0
A	80	8
B+	70	0
B	60	0
U	LESSTHAN 50	1
UA	UA	0
No of Students Attended		9
ATTAINMENT %		89
Course Outcomes		ATTAINMENT LEVEL
CO1		3
CO2		3
CO3		3
CO4		3
CO5		3

Shiva Shankari
FACULTY

J. Jayasri
HOD

CARE COLLEGE OF ENGINEERING, TRICHY
DEPARTMENT : Electronics and Communication Engineering
R2017: COURSE CODE & NAME: EC8501 Digital Communication
FACULTY NAME: Mrs.M.Shivashankari

Course Outcome Attainment (R2017)

COURSE OUTCOME	Direct					Indirect	CO Attiainment = ((Internal*0.20+Univ*0.80)*0.70+Indirect*0.30)
	IA1	IA2	MODEL	Internal	Univ		
CO 1	3	0.1	0.1	1	3	2.78	**2.65**
CO 2	2	0.1	3	2	3	2.78	**2.79**
CO 3	0.1	2	0.1	1	3	2.56	**2.59**
CO 4	0.1	1	0.1	0	3	2.56	**2.45**
CO 5	0.1	0.1	2	1	3	2.56	**2.59**

Mapping course outcome with programme outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2			2	2				
CO2	3	3	2	2	2	2			1	1				
CO3	3	3	2	2	2	1			1	1				
CO4	2	2	2	2	3	3			1	1				
CO5	2	2	3	3	2	1			1	1				

PO ATTAINMENT:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1.77	1.77	1.77	1.77	1.77	1.77	0.00	0.00	1.77	1.77	0.00	0.00	0.00	0.00
CO2	2.79	2.79	1.86	1.86	1.86	1.86	0.00	0.00	0.93	0.93	0.00	0.00	0.00	0.00
CO3	2.59	2.59	1.72	1.72	1.72	0.86	0.00	0.00	0.86	0.86	0.00	0.00	0.00	0.00
CO4	1.63	1.63	1.63	1.63	2.45	2.45	0.00	0.00	0.82	0.82	0.00	0.00	0.00	0.00
CO5	1.72	1.72	2.59	2.59	1.72	0.86	0.00	0.00	0.86	0.86	0.00	0.00	0.00	0.00
AVERAGE PO	2.10	2.10	1.91	1.91	1.91	1.56	0.00	0.00	1.05	1.05	0.00	0.00	0.00	0.00

Shiva Shankari M
FACULTY

J. Jayasi
HOD/ECE

CARE COLLEGE OF ENGINEERING

(Approved by AICTE and Affiliated to Anna University, Chennai)

27, Thayanur, Trichy – 620009

Department of ECE

Course End Survey

Branch: ECE Semester: V Sem

Course Code & Name: EC 8501 DIGITAL COMMUNICATION

Faculty In-charge:M.Shiva Shankari Academic Year: 2021-22, Odd

	Student									
Course Outcome	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Average**
CO1	3	2	2	3	3	3	3	3	3	**2.8**
CO2	3	2	2	3	3	3	3	3	3	**2.8**
CO3	2	2	2	3	3	3	3	2	3	**2.6**
CO4	3	2	2	3	3	3	2	3	2	**2.6**
CO5	3	2	2	3	3	2	2	3	3	**2.6**

Faculty

HOD/ECE

CARE
COLLEGE OF ENGINEERING
(Approved by AICTE and Affiliated to Anna University, Chennai)
27, Thayanur, Trichy – 620009

STUDENT FEEDBACK ON FACULTY

Dear Student,

Here are some questions for which we expect your unbiased, impartial and open-minded answer. This is to know your individual opinion on the effectiveness of the classes handled by your faculty and also his / her readiness to help you in developing your career and personality.

Deparment	Electronics and Communication Engineering	Academic Year		2021-2022	Semester	V	
Faculty Name:		Mr.R.Deepakkhanna	Mr.J.Jedidha	Ms.K.Rubitha	Ms.M.Shivashankari	Mr.S.Nabeshwaran, AP/Mech	Mr.S.Shiek Imam, AP/Civil
Subject Code and Name:		EC8551- Communication Networks	EC8852- Computer Architecture and Organization	EC8553- Discrete-Time Signal Processing	EC8501- Digital Communication	GE8077- Total Quality Management	OCE551- Air Pollution and Control Engineering

S. No.	Questions	Select the Marks in the following Table with the grades: 5 - Excellent, 4 - Very Good, 3 - Good, 2 - Satisfactory, 1 - Fair					
1	Does the faculty come prepared on lessons?	5	5	5	5	5	5
2	Does the faculty present the lessons clearly and orderly?	5	5	5	5	5	5
3	Does the faculty speak with the voice clarity and effective body language?	5	5	5	5	5	5
4	Is the faculty capable of keeping the class under discipline and control?	5	5	5	5	5	5
5	Does the faculty command students' attention and give response to students' doubts and questions?	5	5	5	5	5	5
6	Does the faculty possess depth of knowledge in subject?	5	5	5	5	5	5
7	Does the faculty show readiness to give assignments to improve the studies?	5	5	5	5	5	5
8	Is the faculty available outside class hours to clarify doubts if requested to by students?	5	5	5	5	5	5
9	Does the faculty help the students to clear the doubts and guide them for the successful completion of the practical programme?	5	5	5	5	5	5
10	Does the faculty use the black board effectively?	5	5	5	5	5	5
11	Is the faculty regular and punctual?	5	5	5	5	5	5
12	Does the faculty come with neat dress and posture?	5	5	5	5	5	5
13	Does the faculty insist on keeping the records up to date and neat?	5	5	5	5	5	5
14	Does the faculty take interest in maintaining discipline anywhere in the college premises?	5	5	5	5	5	5
15	Does the faculty remind you about your responsibility to the institution?	5	5	5	5	5	5
16	Do you find the faculty unbiased and open minded in judgement?	5	5	5	5	5	5
17	Do you find the faculty patient and considerate?	5	5	5	5	5	5
18	Do you find the faculty impartial and honest in paper valuation and personal remark making?	5	5	5	5	5	5
19	Do you find the faculty inspiring in the class as well as outside?	5	5	5	5	5	5
20	Do you find in the faculty, a true friendly support with elderly affection?	5	5	5	5	5	5
	Total Marks:	100	100	100	100	100	100

Date : Friday
22/11/21

Signature of the HOD

CARE
COLLEGE OF ENGINEERING
(Approved by AICTE and Affiliated to Anna University, Chennai)
27, Thayanur, Trichy – 620009

STUDENT FEEDBACK ON FACULTY

Dear Student,

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Department	Electronics and Communication Engineering	Academic Year		2021-2022	Semester	V	
Faculty Name:		Ms.R.Deepalakshmi	Ms.J.Jedidha	Ms.K.Rubiha	Ms.M.Shivasharmakari	Mr.S.Maheshwaran, AP/Mech	Mr.S.Shiek Imam, AP/Civil
Subject Code and Name:		EC8551- Communication Networks	EC8552- Computer Architecture and Organization	EC8553- Discrete-Time Signal Processing	EC8501- Digital Communication	GE8077- Total Quality Management	OCE551- Air Pollution and Control Engineering
S. No.	Questions	Select the Marks in the following Table with the grades: 5 - Excellent, 4 - Very Good, 3 - Good, 2 - Satisfactory, 1 - Fair					
1	Does the faculty come prepared on lessons?	5	4	5	5	3	4
2	Does the faculty present the lessons clearly and orderly?	5	4	5	5	4	4
3	Does the faculty speak with the voice clarity and effective body language?	5	5	5	5	4	4
4	Is the faculty capable of keeping the class under discipline and control?	5	5	5	5	5	5
5	Does the faculty command students' attention and give response to students' doubts and questions?	5	4	5	5	4	4
6	Does the faculty possess depth of knowledge in subject?	5	3	5	5	3	4
7	Does the faculty show readiness to give assignments to improve the studies?	5	5	5	5	5	5
8	Is the faculty available outside class hours to clarify doubts if requested to by students?	5	4	5	5	4	4
9	Does the faculty help the students to clear the doubts and guide them for the successful completion of the practical programme?	5	4	5	5	4	4
10	Does the faculty use the black board effectively?	5	5	5	5	5	5
11	Is the faculty regular and punctual?	5	5	5	5	5	5
12	Does the faculty come with neat dress and posture?	5	5	5	5	5	5
13	Does the faculty insist on keeping the records up to date and neat?	5	5	5	5	5	5
14	Does the faculty take interest in maintaining discipline anywhere in the college premises?	5	5	5	5	5	5
15	Does the faculty remind you about your responsibility to the institution?	5	5	5	5	5	5
16	Do you find the faculty unbiased and open minded in judgement?	4	4	4	4	4	4
17	Do you find the faculty patient and considerate?	5	5	5	5	4	4
18	Do you find the faculty impartial and honest in paper valuation and personal remark making?	5	5	5	5	4	5
19	Do you find the faculty inspiring in the class as well as outside?	5	5	5	5	4	4
20	Do you find in the faculty, a true friendly support with elderly affection?	5	5	5	5	5	5
	Total Marks:	99	94	99	99	87	90

Date : Today
2/11/21

Signature of the HOD

CARE
COLLEGE OF ENGINEERING
(Approved by AICTE and Affiliated to Anna University, Chennai)
27, Thayanur, Trichy – 620009

STUDENT FEEDBACK ON FACULTY

Dear Student,
Here are some questions for which we expect your unbiased, impartial and open-minded answer.
This is to know your individual opinion on the effectiveness of the classes handled by your faculty and also his / her readiness to help you in developing your career and personality.

Department	Electronics and Communication Engineering	Academic Year		2021-2022	Semester	V	
Faculty Name:		Ms.R.Deepalakshmi	Mr.J.Jeslin	Ms.K.Rubitha	Ms.M.Shivashankari	Mr.S.Maheshwaran, AP/Mech	Mr.S.Shiek Imam, AP/Civil
Subject Code and Name:		EC8551- Communication Networks	EC8553- Computer Architecture and Organization	EC8553- Discrete-Time Signal Processing	EC8501- Digital Communication	GE8077- Total Quality Management	OCE551- Air Pollution and Control Engineering
S. No.	Questions	Select the Marks in the following Table with the grades:5 - Excellent, 4 - Very Good, 3 - Good, 2 - Satisfactory, 1 - Fair					
1	Does the faculty come prepared on lessons?	5	5	5	5	5	5
2	Does the faculty present the lessons clearly and orderly?	5	5	5	5	5	5
3	Does the faculty speak with the voice clarity and effective body language?	5	5	5	5	5	5
4	Is the faculty capable of keeping the class under discipline and control?	5	5	5	5	5	5
5	Does the faculty command students' attention and give response to students' doubts and questions?	5	5	5	5	5	5
6	Does the faculty possess depth of knowledge in subject?	5	5	5	5	5	5
7	Does the faculty show readiness to give assignments to improve the studies?	5	5	5	5	5	5
8	Is the faculty available outside class hours to clarify doubts if requested to by students?	5	5	5	5	5	5
9	Does the faculty help the students to clear the doubts and guide them for the successful completion of the practical programme?	5	5	5	5	5	5
10	Does the faculty use the black board effectively?	5	5	5	5	5	5
11	Is the faculty regular and punctual?	5	5	5	5	5	5
12	Does the faculty come with neat dress and posture?	5	5	5	5	5	5
13	Does the faculty insist on keeping the records up to date and neat?	5	5	5	5	5	5
14	Does the faculty take interest in maintaining discipline anywhere in the college premises?	5	5	5	5	5	5
15	Does the faculty remind you about your responsibility to the institution?	5	5	5	5	5	5
16	Do you find the faculty unbiased and open minded in judgement?	5	5	5	5	5	5
17	Do you find the faculty patient and considerate?	5	5	5	5	5	5
18	Do you find the faculty impartial and honest in paper valuation and personal remark making?	5	5	5	5	5	5
19	Do you find the faculty inspiring in the class as well as outside?	5	5	5	5	5	5
20	Do you find in the faculty, a true friendly support with elderly affection?	5	5	5	5	5	5
	Total Marks:	100	100	100	100	100	100

Date :
22/11/21

Signature of the HOD

CARE
COLLEGE OF ENGINEERING

(Approved by AICTE, New Delhi, Affiliated by Anna University, Chennai)

Feedback by faculty in-charge on the handled course

From

M.Shiva Shankari,
Assistant Professor,
Department of ECE,
CARE College of Engineering,
Trichy-620009

To

The Principal,
CARE College of Engineering,
Trichy-620009

Through The Head of the Department, ECE

Respected Madam,

Sub: My Feedback on EC 8501 Digital Communication, Fifth semester, AY 2021-22 for forthcoming academic year.

It is herewith brought to your kind attention that I have handled EC 8501 Digital Communication, Fifth semester 2019-2023 batch in the Academic year 2021-22 Odd Semester. In this regard, I wish to convey my feed back to the forthcoming academic year as follows:

- This subject consists of 80% Theory and 20% problems. Hence, I have shared many video tutorials in connection with the subject as it is laboratory oriented also.
- The subject also includes more mathematical equations later on I made a revision of online class topics in black board methodology also.
- This subject is related to laboratory so most units are related with the theoretical concepts.
- To ensure the students understanding, I solved more tutorial problems in group and gave assignments for better understanding
- Also given mcq practice for better conceptual analysis

Suggestion to the forthcoming semesters:

- Students faced many issues due to online classes in understanding the technical concepts. So different activity based worksheets and quiz can be conducted often to understand the basic concepts as they are lagging in basics. So in forthcoming semesters we can rectify those issues in a right planning way.

Thanking you,

Yours Sincerely,

(M.Shiva Shankari)

Place: Trichy
Date: 29.12.2021

J. Jaya
HOD/ECE