SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES

AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

18ECE321 – DIGITAL COMMUNICATIONS

Question No.	Questions	PO Attainment
UNIT – 1: BASE BAND DATA TRANSMISSION-I		
PART A (2 Marks)		
1	List the advantages of digital communication over analog communication?	PO1
2	Draw the block diagram of Digital communication system?	PO1
3	Define sampling and mention its types?	PO1
4	Explain Non uniform quantization?	PO1
5	Define the term companding?	PO1
6	Discuss the advantages of DM over PCM.	PO1
7	Define Quantization error and write it's range?	PO1
8	Discuss about differential quantization?	PO1
9	Define Prediction filter and where it is used?	PO1
10	Draw the Manchester encoding signaling for information 11010011?	PO1
11	Define regenerative repeater in PCM system?	PO1
12	Discuss the bandwidth of PCM system?	PO1
13	Write the disadvantages of DM system?	PO1
14	Expand PCM, DPCM, DM & ADM?	PO1
15	If step size is 4V in case of PCM and DM then what is the corresponding quantization noises?	PO1
16	How will you avoid Slope overload distortion?	PO1
17	Define Granular Noise?	PO1
18	What are the advantages in ADM?	PO1
19	Find the output SQNR of delta modulation is sampling rate is 8KHz, f_m= 2KHz?	PO1
20	List the applications of PCM system?	PO1
PART-B (10 Marks)		
1	Explain the model of Digital Communication with neat diagram and write its advantages and disadvantages over analog communications?	PO1
2	(A) Distinguish between the types of sampling with neat schematics, listing out their Merits and Demerits? (B) In a single integration Delta modulation system the voice signal is sampled at a rate of 64 KHZ. The max signal amplitude is 1V, the highest frequency component is 3KHZ. i) Determine the min value of the step size Δ to avoid Slop overload error. ii) Determine the granular noise power if the voice signal bandwidth is 3.5KHz. iii) Assuming the voice signal is sinusoidal determine the output signal power and SQNR iv) Determine the Minimum Transmission bandwidth?	PO1, PO2, PO3
3	What is Quantization? Briefly explain about the different types of quantization?	PO1, PO2
4	Briefly explain about the different types of Encoding techniques to information as 10101110?	PO1, PO2
5	Explain the block diagram for PCM transmitter and receiver with transmission path?	PO1, PO2
6	Derive an expression of overall SNR and formulate in dB to the PCM system?	PO2, PO3
7	Explain the block diagram for DPCM transmitter and receiver with neat waveforms?	PO1, PO2
8	(A) Discuss the each and every block in Delta Modulation with neat waveforms? (B) A TV signal with a bandwidth of 4.2 MHz is transmitted using PCM Systems. The no of Quantization levels are 512. Calculate i) Codeword length ii) Final bit rate iii) Transmission bandwidth iv) SQNR	PO1, PO2
9	Derive an expression of overall Signal to Noise ratio to the DM system?	PO2, PO3
10	Discuss about ADM system and Compare PCM, DPCM, DM and ADM?	PO1

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Question No.	Questions	PO Attainment
UNIT – 2: BASE BAND DATA TRANSMISSION-II		
PART A (2 Marks)		
1	What is the difference between base band transmission and band pass transmission?	PO1
2	Explain a Base band Signal receiver?	PO1
3	Explain optimum receiver?	PO1
4	Define ISI and discuss?	PO1
5	What are the applications of TDM?	PO1
6	Define Ideal solution of ISI?	PO1
7	Define raised cosine function?	PO1
8	Define Equalization?	PO1
9	Define Correlation receiver?	PO1
10	What is S/N ratio at the output of matched filter?	PO1
11	Define Schwarz inequality?	PO1
12	Define Duo binary signaling. What are the disadvantages of it?	PO1
13	Draw eye pattern and explain the significance of eye pattern?	PO1
14	Draw the Block Diagram for correlation receiver?	PO1
15	Define M-ary Encoding?	PO1
16	List two applications for eye pattern?	PO1
17	Compare Binary encoding and M-ary encoding?	PO1
18	Write the equation of probability error for binary UNRZ encoding?	PO1
19	Define split phase and differential encoding with examples?	PO1
20	List the Properties of Matched Filter?	PO1
PART-B (10 Marks)		
1	Explain in detail about TDM with neat block diagram	PO1
2	Derive the Power Spectral Density of NRZ using Unipolar format?	PO2, PO3
3	Write the help of a block diagram explain Base Band Binary data Transmission system?	PO1
4	(A) Discuss the inter symbol interference problem? (B) Write a brief note on Eye Pattern with neat diagrams	PO1
5	Evaluate the M-ary encoding and also calculate probability of error when data's are transmitted?	PO1, PO2
6	With the help of a block diagram explain duo binary signaling scheme.	PO1
7	Design receiver filter to maximize SNR and explain why it is called Matched filter?	PO1, PO2, PO3
8	Explain how Nyquist pulse shaping criterion is helpful in eliminating the ISI?	PO1, PO2
9	(A)Explain the design and analysis M-ary Encoding (or) Signalling scheme (B) Comparison between Binary & M-ary signaling scheme?	PO1, PO2, PO3
10	Derive an expression for probability error of NRZ using Unipolar format?	PO1, PO2, PO3

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Question No.	Questions	PO Attainment
	UNIT – 3: SOURCE ENCODING AND DECODING	
	PART A (2 Marks)	
1	Define Information and write its units?	PO1
2	Define Entropy and information rate?	PO1
3	List the properties of entropy?	PO1
4	Define joint and Conditional Entropy?	PO1
5	What is mutual information and define self information?	PO1
6	List the properties of mutual information?	PO1
7	Prove I(XY)= H(X)+H(Y)-H(XY)	PO1
8	Define symmetric channel and give one example?	PO1
9	What is BEC and draw its graphical representation?	PO1
10	Define Coding Efficiency?	PO1
11	What are the variable length coding techniques?	PO1
12	State Channel capacity theorem?	PO1
13	Define Channel capacity and write its units?	PO1
14	What is the channel capacity for BSC?	PO1
15	What is the channel capacity for BEC?	PO1
16	Write the relations between different types of entropies?	PO1
17	Find the entropy to the 4 events with probabilities ½, ¼, 1/8, 1/8.	PO1
18	What are the minimum and maximum values of the Entropy?	PO1
19	Define redundancy with coding efficiency?	PO1
20	Draw the Venn diagram of Mutual Information?	PO1
	PART-B (10 Marks)	
1	(A) Define Entropy and state and prove properties of Entropy? (B) A continuous signal is band limited to 5KHz, the signal is sampled and quantized into 8 levels of a PCM system, the probability of occurrence of each level are 0.25, 0.2, 0.2, 0.1, 0.1, 0.05, 0.05, 0.05. Calculate the entropy and Information rate?	PO1, PO2
2	State and prove Shannon Hartley Theorem?	PO2, PO3
3	(A) Discuss Mutual information and write its properties? (B) A graph source having two symbols 'dot' and 'dash'. Dot duration is 0.2sec and dash duration is 3 times the dot duration. The probability of dot occurring is twice that of dash occurrence and time difference between dot and dash is 0.2sec. Find the entropy and information rate telegraph source?	PO1, PO2, PO3
4	Illustrate the formulae for the joint and conditional entropies, mention their relation between them?	PO1, PO2
5	Discuss about Binary Symmetric Channel and derive expression for channel capacity?	PO1, PO2
6	Discuss about Binary Erasure Channel and derive expression for channel capacity?	PO1, PO2
7	A source is transmitting messages A,B, C, D, E, F with corresponding probabilities ½, ¼, 1/8, 1/16, 1/32, 1/32. Find the coding efficiency using Shannon Fano binary coding?	PO1, PO3
8	A source is transmitting six messages with probabilities 0.3, 0.25, 0.15, 0.12, 0.10, 0.08 respectively. Find the coding efficiency and redundancy using Huffman binary coding?	PO1, PO2
9	Discuss about algorithms to find transmission efficiency in shannon fano coding and Huffman coding?	PO1, PO2
10	Investigate the transmission efficiency using Huffman coding & Shannon Fano coding for the following data [X] = [S_0 S_1 S_2 S_3 S_4 S_4] [P(X)] = [0.3 0.15 0.08 0.25 0.12 0.10]	PO1, PO2, PO3

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Question No.	Questions	PO Attainment
	UNIT – 4: CHANNEL ENCODING AND DECODING	
	PART A (2 Marks)	
1	Define ARQ and FEC of error control coding?	PO1
2	Define systematic and non systematic linear block codes?	PO1
3	Find the generator matrix to the following parity check matrix? $\mathbf{H}=\begin{bmatrix}1&0&1&1&0&0\\1&1&1&0&1&0\\0&1&1&0&0&1\end{bmatrix}$	PO1
4	List an error detecting and correcting capabilities of block codes?	PO1
5	Draw the encoder diagram for (7,4) block code?	PO1
6	List an error detecting and correcting capabilities of cyclic codes?	PO1
7	Draw the syndrome decoding diagram for (6,3) block code?	PO1
8	Discuss the systematic and non systematic cyclic codes?	PO1
9	List the advantages and disadvantages of cyclic codes?	PO1
10	Explain convolutional coding.	PO1
11	What are convolutional codes how they are different from block codes.	PO1
12	What is constraint length for convolutional encoders	PO1
13	How many coding techniques are used for transmission the digital data?	PO1
14	Define the term Surviving path in Viterbi Algorithm.	PO1
15	Define the following terms a) code vector b)Hamming Distance	PO1
16	What are the types of error control methods?	PO1
17	What are the types of encoding methods of convolutuinal codes?	PO1
18	List the advantages of convolutional codes over block codes?	PO1
19	Compare between code tree and trellis diagram?	PO1
20	Define Hamming distance and calculate its value for two code words 11100 and 11011	PO1
	PART-B (10 Marks)	
1	(A) What is FEC and explain in detail? (B) Explain the matrix representation of linear block codes?	PO1, PO2
2	The generator polynomial of a (7,4) hamming code is defined by: g(X) = 1+P+P^2. Develop an encoder and syndrome calculator for this code, using a systematic form of the code.	PO1, PO2, PO3, PO4
3	A generator matrix for a (6, 3) block code is given below $G=\begin{bmatrix}1&1&0&1&0&0\\0&1&1&0&1&0\\1&0&1&0&0&1\end{bmatrix}$] A) List all the code vectors, draw the encoder diagram B) Find out minimum distance & weight C) How many errors can be detected &corrected.	PO1, PO2, PO3
4	A (2, 1, 3) convolutional code is described by $g_1=(111), g_2=(101)$ (i) Draw the encoder diagram. (ii) Illustrate the encoded output sequence for an input sequence is ' 1 0 1 0 1 ' (iii) Design code tree diagram and trellis diagrams.	PO1, PO2, PO3, PO4
5	Explain viterbi algorithm to decode a convolutional coded message?	PO1, PO2
6	Discuss about Linear block codes and cyclic codes with mathematical expressions?	PO1, PO2

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7	The generator polynomial of a (7,4) hamming code is defined by: $g(X) = 1+P+P^3$. Design an encoder for given cyclic code and Design syndrome calculator for this code with received vector Y=[1 0 0 1 1 0 1].	PO1, PO2, PO4
8	The parity check matrix of (6,3) block code is given as $H = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$ (i) Determine the generator Matrix (ii) Find all the code words & minimum distance. (iii) Design the encoder & syndrome diagrams. (iv) Calculate syndrome vector & decode the code word if received code word is **110110**	PO1, PO2, PO4
9	A (2, 1, 3) convolutional code is described by $g_1 = (111), g_2 = (101)$ (i) Draw the encoder diagram. (ii) Illustrate the encoded output sequence for an input sequence is ' 1 1 0 1 1 ' (iii) Design state diagram and trellis diagrams.	PO1, PO2, PO3, PO3
10	A (2, 1, 3) convolutional code is described by $g_1 = (111), g_2 = (101)$ The output of the detector is '1 1 0 1 0 1 1 0 0 1'. Find the transmitted data using Viterbi Algorithm?	PO1, PO2, PO3, PO4

Question No.	Questions	PO Attainment
UNIT – 5: BAND PASS DATA TRANSMISSION		
PART A (2 Marks)		
1	Explain the types of digital modulation techniques?	PO1
2	List the advantages of band pass data transmission?	PO1
3	What is meant by DPSK?	PO1
4	Bring out the difference between coherent & non coherent binary modulation scheme	PO1
5	Write the two differences between DPSK and BPSK?	PO1
6	Give a brief note on BFSK?	PO1
7	List the applications of BASK?	PO1
8	Discuss about M-ary signaling schemes?	PO1
9	What is meant by Probability of error & Bit Error Rate	PO1
10	Explain the role of QPSK?	PO1
11	Draw the BASK waveform for 011011	PO1
12	Differentiate coherent FSK from Non-coherent FSK	PO1
13	What are the drawbacks of binary PSK system?	PO1
14	Draw its constellation diagram for BFSK system.	PO1
15	Draw the signal representation of BPSK system	PO1
16	Mention the bandwidths for ASK, FSK & PSK systems	PO1
17	Among ASK, FSK & PSK systems which one is best and why?	PO1
18	For the binary data [1 1 0 1 0 1], draw the message, carrier and BPSK waveforms?	PO1
19	Write the expression for probability error of BASK system	PO1
20	Draw its constellation diagram for QPSK system.	PO1

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PART-B (10 Marks)		
1	Explain about generation of BASK system with time & frequency domain waveforms & draw the signal space representation (constellation diagram)?	PO1, PO2
2	Derive an expression of error probability for BPSK system and draw its constellation diagram?	PO1, PO2, PO4
3	Explain about generation of FSK system with time & frequency domain waveforms & discuss coherent and non coherent detection of BFSK?	PO1, PO2
4	(A) Derive an expression of error probability for BASK system? (B) Discuss coherent and non coherent detection of BFSK?	PO1, PO2, PO4
5	Explain the process of DPSK modulation and demodulation with binary sequence "0 0 1 0 0 1 0 0".	PO1, PO2
6	Compare digital modulation schemes ASK, FSK & PSK which are used in communication?	PO1, PO2
7	Draw the block diagram of QPSK transmitter & receiver and explain each block in detail.	PO1, PO2
8	(A) Derive the probability of error for BFSK. (B) Discuss in brief about coherent detection of binary PSK	PO1, PO2, PO4
9	Draw the block diagram of DPSK transmitter & receiver and explain each block in detail.	PO1, PO2
10	Binary data has to be transmitted over a telephone link that has a usable bandwidth of 3000Hzand maximum achievable signal to noise ratio is 6dB at its output. (a) Determine the maximum signal rate and probability error if a coherent ASK scheme is used for transmitting binary data through channel. (b) If the data rate is maintained at 300 bits/sec, Calculate error probability?	PO1, PO3, PO4

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