Reg. No.																

Question Paper Code	13108

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Fifth Semester

Electronics and Communication Engineering

20ECPC501 - DIGITAL COMMUNICATION

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Amount of Information is represented by (a) lk (b) Pk (c) 1/ Pk (d) H	1	K1	CO1
2.	Which of the following statement is correct? (a) H(Y, Z/X) <= H(Y/X) + H(Z/X) (b) H(Y, Z/X) <= H(Z/X) + H(Y/X) (c) H(Y, Z/X) = H(Y/X) + H(Z/X,Y) (d) All of the above.	1	K1	CO1
3.	Equivocation is the (a) Conditional entropy (b) Joint entropy (c) Individual entropy (d) None of the mentioned	1	K1	CO1
4.	Which of the following reduces redundancy? (a) Source coding (b) Channel coding (c) Both source coding and channel coding (d) None of the mentioned	1	K1	CO2
5.	A shannon-fano algorithm _____ average information per bit. (a) Increases (b) Decreases (c) Has no effect (d) None of the mentioned	1	K1	CO2
6.	The efficiency η of the code for DMS with source probabilities {0.35, 0.25, 0.20, 0.15, 0.05} is (a) 95.4% (b) 96.5% (c) 96.4% (d) 94.6%	1	K2	CO2
7.	In unipolar line encoding 1 and 0 is represented as (a) 0 →1, 1 →-p(t) (b) 0 →0, 1 →p(t) (c) 0 →0, 1 →-p(t) (d) None of the above	1	K2	CO3
8.	Quantising noise can be reduced by increasing the (a) Number of standard quantum levels (b) Sampling rate (c) Bandwidth (d) All of the above	1	K1	CO3
9.	Sample resolution for LPCM _____ bits per sample (a) 8 (b) 16 (c) 24 (d) All of the above	1	K1	CO3
10.	Examples of nyquist filters are (a) Root raised cosine filter (b) Raised cosine filter (c) Root raised & Raised cosine filter (d) None of the mentioned	1	K1	CO4
11.	For AWGN, the noise variance is (a) N_0 (b) $N_0/2$ (c) 2 N_0 (d) $N_0/4$	1	K1	CO4
12.	_____ in the transmitted signal results in a carrier offset (a) Power spectral density (b) Signal energy (c) Symbol synchronization (d) Propagation delay	1	K1	CO4
13.	Symbol rate is also called _____ (a) Bit rate (b) Baud rate (c) Sign rate (d) All of the above	1	K2	CO5
14.	Which is called as on-off keying? (a) Amplitude shift keying (b) Uni-polar PAM (c) Amplitude shift keying & Uni-polar PAM (d) None of the mentioned	1	K1	CO5

15.	FSK reception uses (a) Correlation receiver (b) PLL (c) Correlation receiver & PLL (d) None of the mentioned	*1*	*K1*	*CO5*
16.	Which system uses QAM? (a) Digital microwave relay (b) Dial up modem (c) Digital microwave relay & Dial up modem (d) None of the mentioned	*1*	*K1*	*CO5*
17.	How many redundant bits are added in block codes for k information bits and n code bits? (a) n+k (b) n-k (c) k^2 (d) n^2	*1*	*K2*	*CO6*
18.	The cyclic codes are designed using (a) Shift registers with feedback (b) Shift registers without feedback (c) Flipflops (d) None of the mentioned	*1*	*K2*	*CO6*
19.	In Viterbi's algorithm, which metric is adopted for decision making? (a) Hamming distance (b) Galois Field (c) Hamming bound (d) Parity-check	*1*	*K2*	*CO6*
20.	Example for convolution encoder state diagram is (a) Tree diagram (b) Trellis diagram (c) Tree & Trellis diagram (d) None of the mentioned	*1*	*K2*	*CO6*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	What is Uncertainty?	*2*	*K1*	*CO1*
22.	State the significance of the entropy H(X/Y) of a communication system where X is the transmitter and Y is the receiver.	*2*	*K2*	*CO1*
23.	If the source efficiency of a DMS is 82% then determine code redundancy.	*2*	*K2*	*CO2*
24.	Distinguish the different source coding techniques.	*2*	*K2*	*CO2*
25.	Why is delta modulation superior to Differential pulse code modulation?	*2*	*K2*	*CO3*
26.	State NRZ polar format.	*2*	*K2*	*CO3*
27.	Compare a matched filter and a correlation receiver.	*2*	*K2*	*CO4*
28.	Illustrate the eye pattern with a diagram.	*2*	*K2*	*CO4*
29.	Differentiate coherent detection and non-coherent detection.	*2*	*K2*	*CO5*
30.	Define syndrome decoding.	*2*	*K1*	*CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Explain the following (i) Mutual information and its properties. (ii) Channel capacity and its equation	*10*	*K2*	*CO1*
		OR			
	b)	A black and white TV picture consists of about 2×106 picture elements with 16 different brightness levels, with equal probabilities. If pictures are repeated at the rate of 32 per second, calculate the 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.	*10*	*K2*	*CO1*
32.	a)	A discrete memoryless source has an alphabet of five symbols whose probabilities of occurrence are as described below. Compute the Huffman code for this source. Also calculates the efficiency of the source encoder. Symbols: {X1, X2, X3, X4, X5} Probability: {0.2, 0.2, 0.1, 0.1, 0.4}.	*10*	*K3*	*CO2*
		OR			

b) Five symbols of the alphabet of discrete memory less source and their probabilities are given as {S1,S2,S3,S4,S5) and {0.4,0.19,0.16,0.15,0.10}. Construct using Shannon-fano Coding and Calculate the code efficiency. *10 K3 CO2*

33. a) Explain in detail about Delta Modulation with neat diagrams and explain its disadvantages. *10 K2 CO3*

OR

b) Derive and draw the Power Spectra of Bipolar NRZ. *10 K2 CO3*

34. a) Explain modified Duobinary signaling scheme with a neat diagram. *10 K2 CO4*

OR

b) Describe in detail about correlative coding to eliminate ISI. *10 K2 CO4*

35. a) Explain in detail about QAM generation, signal space representation, and PSD. *10 K2 CO5*

OR

b) Derive the Error Probability of coherently detected BPSK. *10 K2 CO5*

36. a) The Generator Matrix for a (7,4) block code is given below. Find all code vectors of this code. *10 K3 CO6*

$$\begin{vmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{vmatrix}$$

(i) Determine P sub matrix from generator matrix

(ii) List all the code vectors

(iii) Find the minimum distance between code vectors

(iv) Determine Error detection and error correction capability.

OR

b) Determine the generator polynomial g(D) for a (7,4) cyclic code is given by $g(D)=1+D+D^3$ and find all the code vector for systematic and non-systematic cyclic codes. *10 K3 CO6*