Reg. No.															

B.Tech. DEGREE EXAMINATION, NOVEMBER 2023
Sixth Semester

18ECE313T – DIGITAL COMMUNICATION SYSTEMS
(For the candidates admitted from the academic year 2020-2021 to 2021-2022)

Note:
(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours Max. Marks: 100

PART – A (20 × 1 = 20 Marks)
Answer **ALL** Questions

	Marks	BL	CO	PO
1. The difference between two adjacent discrete values is called (A) Step size (B) Quantum (C) Pulse (D) Sample	1	1	1	1
2. Quantization noise occurs in (A) TDM (B) FDM (C) PCM (D) PWM	1	1	1	1
3. Nyquist frequency is given by (A) $f_m > 2f_s$ (B) $f_m = 2f_s$ (C) $f_s \geq 2f_m$ (D) $f_s < 2f_m$	1	1	1	1
4. In PCM, the process of signal compression and expansion is called (A) Compression (B) Companding (C) Counter (D) Modulation	1	1	1	1
5. Increasing the step size leads to _____ in the quantization error (A) Increase (B) Decrease (C) No change (D) Oscillation	1	1	2	1
6. Main advantage of DPCM over PCM is (A) Reduces bandwidth (B) Less complexity (C) Noise reduction (D) Cost is less	1	1	2	1
7. Reduntant bits in the message signal will be removed by (A) Reduces bandwidth (B) Less complexity (C) Noise reduction (D) Cost is less	1	2	2	1
8. Adaptive DPCM is used to _____ (A) Increase bandwidth (B) Decrease bandwidth (C) Increase SNR (D) Decreases SNR	1	1	2	1

9. In an M-ary system the eye pattern contains _____ eye openings stacked up where M is the number of discrete amplitude levels 1 1 3 1
   (A) M+1 (B) 2M+1
   (C) M-1 (D) 2M-1

10. A band pass signal has _____ 1 1 4 1
   (A) DC component (B) No DC component
   (C) No sidelobes (D) No error

11. Overlapping of spectra of BPSK signal leads to 1 1 4 1
   (A) Inter channel interference (B) Aliasing
   (C) Inter symbol interference (D) Inter code interference

12. Which modulation scheme have minimum probability of error? 1 1 4 1
   (A) ASK (B) BFSK
   (C) BPSK (D) DPSK

13. A device for the combined operation of modulation and demodulation is called 1 1 4 1
   (A) Modern (B) Transmitter
   (C) Modulator (D) Compander

14. Modified duabinary systems has zero DC by _____ delay in feedback 1 1 3 1
   (A) Reversing (B) Reducing
   (C) Increasing (D) Avoiding

15. In base band transmission, pulser are dispered due to 1 1 3 1
   (A) Bandwidth (B) Efficiency
   (C) Amplitude (D) ISI

16. The entropy of a single message, with probability is _____ 1 1 5 1
   (A) 0 (B) 0.5
   (C) 1 (D) Infinite

17. The probabilities are equally divided and assigned with 0's or 1's in ____ coding technique. 1 1 5 1
   (A) Huffmann (B) Linear
   (C) Shannon Fano (D) Non linear

18. The channel capacity of 20 kHz bandwidth binary system is _____ 1 1 5 1
   (A) 1000 bits/s (B) 10000 bits/s
   (C) 2000 bits/s (D) 20000 bits/s

19. The mutual information of a channel with independent input and output is _____. 1 1 5 1
   (A) Constant (B) Zero
   (C) Infinite (D) Variable

20. _____ is the measure of uncertainty 1 1 5 1
   (A) Entropy (B) Mean
   (C) Average (D) Ensemble

PART – B (5 × 4 = 20 Marks)

Answer **ANY FIVE** Questions

	Marks	BL	CO	PO
21. Sketch the waveform for the binary data sequence 0110011. i. Manchester code ii. NRZ – M	4	3	1	1
22. What is meant by granular noise, slope overload distortion in delta modulation system?	4	1	2	1
23. Compare Pulse Code Modulation (PCM). Differential Pulse Code Modulation (PCM) and Delta Modulation (DM).	4	2	2	3
24. An analog waveform with amplitude range of -10V to 610V and bandwidth of 200Hz is transmitted using PCM. Find minimum sampling rate, minimum bit rate.	4	3	1	3
25. What is M-ary signaling? Draw the constellation diagram of 8-QAM.	4	1	4	1
26. Define source coding. Why do we need source coding?	4	2	5	1
27. Explain the principle of maximum likelihood receiver structure.	4	2	3	1

PART – C (5 × 12 = 60 Marks)

Answer **ALL** Questions

	Marks	BL	CO	PO
28. a. Derive the below given SNR for quantizer of the input signal starting with quantization difference. Q = M – V where M and V represent the quantized and input voltages respectively. $SNR = \left(\frac{3P}{m^2_{\max}} \right) 2^{2R}$	12	3	1	3
(OR)				
b. Explain the process of sampling and signal reconstruction in detail.	12	2	1	1
29. a. Discuss about differential pulse code modulation and demodulation with neat diagram.	12	1	2	1
(OR)				
b. Explain the process of delta modulation and demodulation.	12	2	2	1
30. a. Write short note on the following: i. Maximum likelihood detector	6	2	3	1
ii. Correlation receiver	6	2	3	1
(OR)				
b. The binary data stream 001101101 is applied to the input of a duo-binary system. Determine the duo binary code output and the resulting receive output for with and without precoder.	12	3	3	1

31. a.	Explain the generation and detection of QPSK.	12	2	3	1
	(OR)				
b.	Derive an expression for probability of error in BPSK.	12	3	3	3
32. a.	Find the encoded sequence for the work "COMMITTEE" using Huffman coding. Calculate coding efficiency.	12	3	5	3
	(OR)				
b.	Consider a channel with 2 inputs outputs and noise matrix of channel is given. If input symbols are transmitted with probabilities of ¾ and ¼ . Calculate all entropies and mutual information of give channel matrix $\begin{bmatrix} \frac{2}{3} & \frac{1}{3} \\ \frac{1}{3} & \frac{2}{3} \end{bmatrix}$	12	3	5	3

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