Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2023
ELECTRONICS AND COMMUNICATION ENGINEERING
(2020 SCHEME)

Course Code: **20ECT305**

Course Name: **Analog and Digital Communication**

Max. Marks: **100** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain the need for modulation.
2. Explain the generation of narrow band FM using balanced modulator.
3. A discrete memoryless source X has four symbols x_1, x_2, x_3, x_4 with probabilities $P(x_1) = 0.4$, $P(x_2) = 0.3$, $P(x_3) = 0.2$, $P(x_4) = 0.1$. Calculate H(X).
4. Explain Stochastic Process.
5. Explain companding process with its significance.
6. Explain slope overload distortion.
7. Explain the Nyquist criteria for zero ISI.
8. Explain raised cosine spectrum. Plot the frequency response for different roll-off factors.
9. Sketch the signal constellation diagram for 16QAM.
10. Give the explanation for BER for a BPSK system. Plot BER Vs SNR curve.

PART B

(Answer one full question from each module, each question carries 14marks)

MODULE I

11. a) Derive the expression for DSB-SC modulated wave. Draw its spectrum. (8)
    b) The modulating signal $m(t) = 5\cos(400\pi t)$ frequency modulates a carrier $c(t)=10\cos(10^8 t)$ using a modulator with frequency sensitivity of 10KHz/volt. Calculate the modulation index and bandwidth of the FM signal. (6)

OR

12. a) Explain the phase shift method of SSB generation with the help of neat diagram. Also compare SSB system with DSB-SC system. (10)
    b) Use Carson's rule to compare the bandwidth that would be required to transmit a baseband signal with a frequency range (4)

from 300 Hz to 3 KHz using: (i) NBFM with maximation deviation of 5 KHz. (ii) WBFM with maximum deviation of 75 KHz.

MODULE II

13. a) Obtain the expression for differential entropy of a Gaussian random variable X with mean μ and variance σ^2. (8)
    b) Explain PDF and CDF. Also write their properties. (6)

OR

14. a) Show that the random process X(t) = A cos($w_c t+\theta$), where θ is a random variable uniformly distributed in the range (0, 2π) is a WSS process. (10)
    b) State and explain the relation between autocorrelation and power spectral density. (4)

MODULE III

15. a) Explain delta modulation with necessary diagrams. How does it differs from PCM and DPCM. (10)
    b) Explain quantization with necessary illustrations. (4)

OR

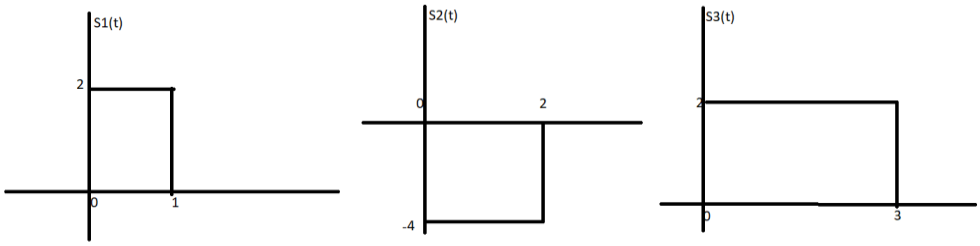
16. a) Explain the design of a linear predictor with reference to Wiener-Hopf equation. (10)
    b) State source coding theorem and channel coding theorem. (4)

MODULE IV

17. a) Explain equalization. Design a zero forcing equalizer for the channel that is characterized by the filter taps {1,0.7,0.3}. (10)
    b) Explain the concept of ML decoding. (4)

OR

18. a) Apply Gram Schmitt Orthogonalization procedure to find the set of orthonormal basis function to represent the three signals S1(t), S2(t) and S3(t). (10)



    b) Explain duobinary encoder with diagram. (4)

MODULE V

19. a) Explain QPSK transmitter and receiver with the help of block diagrams. (10)

b) Draw and explain the signal constellation diagram for QPSK. (4)

OR

20. a) Explain BPSK system and its signal constellation diagram. (10)

b) Explain different modulation schemes used in digital communication. (4)

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