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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2024
ELECTRONICS AND COMMUNICATION ENGINEERING
(2020 SCHEME)

Course Code: **20ECT305**

Course Name: **Analog and Digital Communication**

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

(Answer all questions. Each question carries 3 marks)

1. Determine the peak frequency deviation and modulation index of an FM modulator.
2. Prove that in an AM, the maximum average power transmitted by an AM is 1.5 times the carrier power.
3. Explain the terms sample space, event, cumulative distribution function.
4. List out the properties of power spectral density.
5. What is the significance of companding in PCM transmission.
6. A sinusoidal signal is transmitted using PCM scheme. The target output SNR should be greater than 13 dB. Find the minimum number of the representation levels(L) and minimum number of bits required to represent each sample to achieve above performance?
7. Describe maximum likelihood function decoding.
8. Explain any two properties of a matched filter.
9. Write any three disadvantages of a digital communication system.
10. Explain non coherent detection method.

PART B

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

MODULE I

11. a) Outline the generation of SSB wave using phase shift method with necessary block diagram. (9)
    b) A modulating signal $m(t)=10\cos(2\pi\times10^3t)$ is amplitude modulated with a carrier signal $C(t)=50\cos(2\pi\times10^5t)$. Find the modulation index, carrier power, power required for transmitting AM wave. (5)

OR

12. a) With neat block diagram, explain the working of an FM receiver. (11)
    b) A modulating signal of frequency 5KHz and peak voltage of 6V is used to modulate a carrier of frequency 10MHz and peak voltage of 10V. Determine i) Modulation index ii) frequency of LSB and (3)

USB iii) amplitude of LSB and USB.

MODULE II

13. a) State and prove any two properties of autocorrelation function of a stationary random process. Explain Weiner-Khinchin's theorem. (9)

b) Consider a random process X(t)=Cos(t+A) where A is a random variable that is uniformly distributed over the interval [0, 2π]. Find whether X(t) is wide sense stationary or not. (5)

OR

14. a) Explain the properties of a cumulative distribution function. (5)

b) The cumulative distribution function for a certain random variable is given as

$$F_X(x)=\begin{cases} 0 & -\infty \le x \le 0 \\ kx^2 & 0 < x \le 10 \\ 100k & 10 < x < \infty \end{cases}$$ (9)

i)Find the value of k
ii)Find the value of P(X≤ 5)
iii)Find the value of P(5<X≤ 7)

MODULE III

15. a) Compute A and μ-law quantified values of a signal that is normalized to 0.8 with A=32 and μ =255. (5)

b) Describe the principle of a differential pulse code modulation. Draw and explain the block diagram of a DPCM transmitter with the expression for quantization error. (9)

OR

16. a) A delta modulation system is designed to operate at 3 times the nyquist rate for a signal with a 3KHz band width. The quantizing step size is 250 mV.
i)Determine the maximum amplitude of a 1KHz input sinusoid for which the delta modulator does not show slope overload. (6)
ii)Determine the postfiltered output signal to quantizing noise ratio for the signal of (i).

b) Describe the linear prediction method and derive the expression for Wiener Hopf equation. (8)

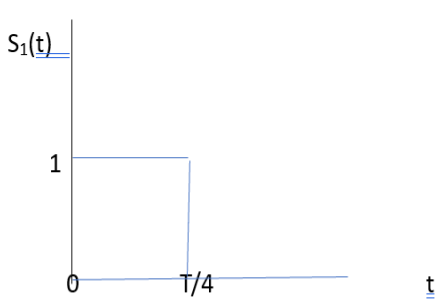
MODULE IV

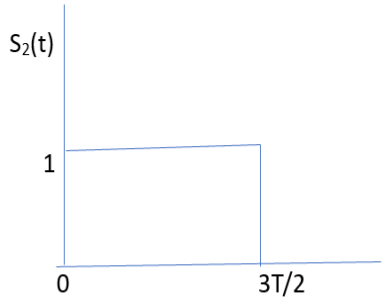
17. a) Explain the conversion of continuous AWGN channel into a vector channel with neat illustration. (10)

b) Explain about inter symbol interference (ISI. (4)

OR

18. a) For the signals $S_1(t)$, $S_2(t)$, $S_3(t)$ and $S_4(t)$, find a set of orthonormal basis function using G-S procedure.





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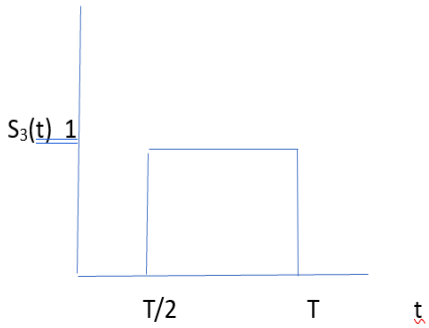

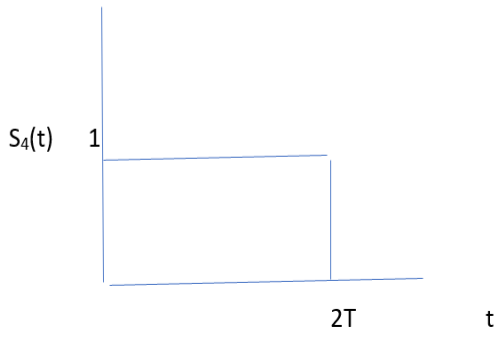

MODULE V

19. a) With neat block diagram, explain the working of QPSK transmission scheme. (10)

b) Explain the principle of a QAM scheme. (4)

OR

20. a) Derive the expression for a BPSK scheme. (10)

b) Explain the probability of error in QPSK system. (4)

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