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53 (EC 502) DGCM

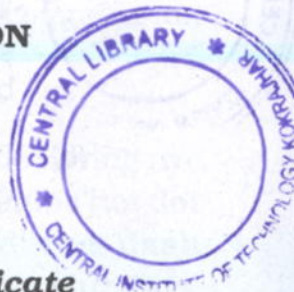
2019

DIGITAL COMMUNICATION

Paper : EC 502

Full Marks : 100

Time : Three hours



The figures in the margin indicate full marks for the questions.

Answer **any five** questions.

1. (a) What is quantisation error in a binary PCM? 4
- (b) Discuss the operation of a binary PCM. 8
- (c) Show that the 'signal-quantisation ratio' in a binary PCM is given by $SNR|_Q = 1.8 + 6 \times n$; where 'n' is the number of bits in a code-word. 8

Contd.

2. (a) Prove that the destination SNR for a linear delta modulator circuit (only for granular noise) is given by

$$\left(\frac{S}{N}\right)_D \leq \left(\frac{3}{8\pi^2}\right) \times \left(\frac{f_s}{W}\right)^3$$

where ' f_s ' is the sampling frequency and ' W ' is the LPF bandwidth.

- (b) Discuss the operation of a DPCM circuit. 10

3. (a) Discuss the coherent detection of ASK bandpass signal and hence calculate the minimum error probability (P_e). 10

- (b) A microwave link is used for transmitting binary data at the rate of 1Mbps. Assuming the two-sided PSD of the noise at the input of the receiver to be 10^{-10} W/Hz, find the average carrier power required to be maintained if the error probability is not to exceed 10^{-4} ; when (i) coherent BPSK and (ii) coherent BFSK are used. Given value of inverse complementary error function of 2×10^{-4} to be 2.629. 10

4. (a) Discuss the method for the generation of BFSK (coherent) modulated signal. 5

- (b) Calculate the power spectra for a binary BFSK signal and hence comment on the result. 15

5. (a) Consider a telegraph source having two symbols : dot and dash. The dot duration is 0.2sec and the dash duration is 3 times the dot duration. The probability of the dot's occurring is twice that of the dash and the time between the symbols is 0.2sec. Calculate the information rate of the telegraph source. 10

- (b) A DMS 'S' has an alphabet $\{s_0, s_1\}$ with probabilities $p(s_0) = p_0 = \frac{1}{4}$ and

$p(s_1) = p_1 = \frac{3}{4}$. Find the entropies of the source 'S' and that for the extended source S^3 . 10



6. Write short notes on **any two** from the following : 10+10

- (a) Line coding in digital communication system
- (b) Bandwidth-power trade-off in PCM
- (c) Error probability with matched filter for polar signaling
- (d) Discrete Memoryless Channel (DMC).

