53 (EC 502) DGCM

2018

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)* Show that the 'signal-quantisation ratio' in a binary PCM is given by

$SNR\,|_Q = 1{\cdot}8 + 6n$;

where 'n' is the number of bits in a code-word. 10

(b) Discuss the operation of a binary PCM. 10

2. *(a)* Prove that the destination SNR for a linear delta modulator (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. 10

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

3. *(a)* A microwave link is used for transmitting binary data at the rate of 1 *Mbps*. 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

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

4. *(a)* Calculate the power spectra for a binary BFSK signal and comment on the result. 15

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

5. *(a)* For a lossless channel, show that $H(x/y) = 0$; where the symbols have their usual significance. 10

(b) A binary memoryless source produces the binary symbols 0 and 1 with probabilities 'p' and '1–p' respectively. Calculate the entropy of this source and hence sketch the variation of the entropy with the probability 'p'. 10

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

(i) Discrete memoryless channel (DMC)

(ii) Optimum filter for digital baseband signalling

(iii) Aperture effect in sampling process.
