Total No. of Questions :12]

SEAT No. :

**P1634**

[Total No. of Pages :3

# [5058] - 82
# T.E. (E & TC)
# DIGITAL COMMUNICATION
# (2008 Course) (Semester - I)

*Time : 3 Hours]* *[Max. Marks :100*

***Instructions to the candidates:***

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section - I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from section - II.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

## SECTION - I

***Q1)*** a) Draw and explain block diagram of DPCM (Differential PCM), transmitter and receiver. Compare DPCM and DM. **[10]**

b) A multifrequency signal is to be converted to digital form using PCM. The frequencies contained in the signal are 2 kHz, 5 kHz, 8 kHz and 10 kHz. Find the minimum sampling rate. Also find the bandwidth for PCM transmission if the number of bits are 8 per sample. **[8]**

OR

***Q2)*** a) If a TV signal of 4.5 MHz bandwidth is to be transmitted using 8 - bit binary PCM.

Determine: **[10]**

i) Maximum signal to Q-zation noise ratio

ii) The minimum bit rate

iii) Minimum transmission bandwidth needed. State advantages of PCM.

b) With the help of neat block schematic, explain Linear Predictive coding. **[8]**

***Q3)*** a) With the help of block diagram, explain PCM-TDM system. **[8]**

b) With suitable example, explain scrambling and descrambling operation. **[8]**

OR

***P.T.O.***

***Q4)*** a) For the given data stream 1100101, draw various line codes such as NRZ, RZ, AMI and Manchester. **[8]**

b) Derive power spectral density of NRZ-unipolar signal. **[8]**

***Q5)*** a) What is Bandpass Random process? Derive and sketch PSD of quadrature components of Bandpass Random process. **[8]**

b) If X (t) = A Cos ($\omega_c t + \phi$) is a random process where $\phi$ is a random variable which is uniformly distributed over $(0, 2\pi)$. Determine Mean and auto correlation function for the same. **[8]**

OR

***Q6)*** a) State and explain properties of auto correlation function. Prove these properties for a random process. **[8]**

b) Explain Gaussian Random Process. Show that mean of a stationary random process is a constant. **[8]**

## SECTION - II

***Q7)*** a) Draw the basic block diagram of DPSK system. Draw necessary waveforms for the same. **[10]**

b) For an FSK system, the following data are observed.

Transmitted binary data rate = $2.5 \times 10^6$ bits/sec.

Power spectral density of noise = $10^{-20}$ W/Hz

Amplitude of received signal = $1\ \mu$V.

Determine the average probability of symbol error assuming coherent detection. **[8]**

OR

***Q8)*** a) Draw and explain block diagram of GMSK modulation. Compare MSK with FSK. **[10]**

b) Considering the data stream 11100 draw waveforms for QPSK modulation system. **[8]**

***Q9)*** a) With the help of diagram explain Integrator and dump filter. **[8]**

b) For a binary baseband data the optimal receiver -5 mV for 0 and +5 mV for 1, corrupted with white Noise of PSD $10^{-9}$ W/Hz. With optimum decision threshold what is the probability of error in reception if data rate is 9600 bits/sec? **[8]**

OR

***Q10)***a) Derive an expression of signal to Noise ratio of Matched filter. **[8]**

b) Explain the working of correlation receiver with neat diagram. **[8]**

***Q11)***a) Draw and explain with the help of waveforms a fast hopping spread spectrum system. **[8]**

b) In a DSSS CDMA system the data rate fb = 6kbps and the chip rate fc = 12 Mb/s. What is the Jamming margin of an output SNR of 10 dB is required for a Pe = $10^{-5}$? Assume a system loss of 1.5 dB. **[8]**

OR

***Q12)***a) Design a hypothetical experiment to measure path loss Ls at frequencies $f_1$ = 30 MHz and $f_2$ = 60 MHz when the distance between the transmitter and receiver is 100 km. Find the effective area of the receiving antenna and calculate the path loss in decibels for each case. **[8]**

b) Explain the terms. **[8]**

i) Cell

ii) Frequency Reuse



iii) Duplexing

iv) Cell splitting