

**[4858] - 1052**  
**T.E. (Electronics)**  
**Data Communication**  
**(2012 Pattern) (End Sem.)**

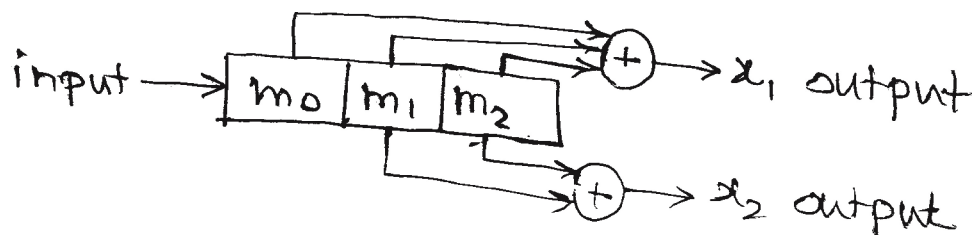
Time : 3 Hours]

[Max. Marks : 70]

*Instructions to the candidates:*

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Compare synchronous and asynchronous way of transmission. Give representative example of each. [4]
- b) Represent a data [10111010] in [6]
- i) Unipolar RZ.
  - ii) Polar RZ.
  - iii) Bipolar RZ.
  - iv) AMI.
- c) Draw a Trellis diagram and state transition diagram for convolution encoder shown in figure: [8]



(Assume suitable data if require)

OR

- Q2)** a) Describe the structure of simple optical fiber and explain the mechanism of light propagation in it. [4]
- b) Write a note on DM with suitable block diagram and waveforms. [6]

**P.T.O.**

- c) Consider a (7,4) block code generated by matrix [8]

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & : & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & : & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & : & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & : & 1 & 1 & 1 \end{bmatrix}$$

Obtain:

- i) All code vectors of this code.
- ii) Parity Check Matrix.
- iii) Syndrome vector, if received data vector is [1111010]

- Q3)** a) Define Entropy. Show that the entropy is maximum when binary message has 50% probability of occurrence. [9]
- b) What steps are involved in Huffman coding procedure? Evaluate the performance of Huffman code over Shannon - Fano code for large message ensemble with equal probabilities. [9]

OR

- Q4)** a) A binary symmetric channel is characterised by channel matrix [9]

$$\begin{bmatrix} P & 1-P \\ 1-P & P \end{bmatrix}$$

Obtain channel capacity for

- i)  $P = 0.2$ .
- ii)  $P = 0.5$ .
- iii)  $P = 0.9$ .

Also comment on obtained results.

- b) Encode given message ensemble with Shannon-Fano encoding scheme. [9]

Message  $X = [x_1 x_2 x_3 x_4 x_5 x_6 x_7 x_8]$

$$\text{Probability } P = \left[ \frac{1}{4} \frac{1}{4} \frac{1}{8} \frac{1}{8} \frac{1}{16} \frac{1}{16} \frac{1}{16} \frac{1}{16} \right]$$

Also, calculate the average length of this code.

- Q5) a)** What is spread spectrum mechanism? Compare DS-CDMA with TDMA. [8]
- b) A communication channel has been identified as frequency selective. DS-SS and FH-SS are the schemes available. Which of the SS technique is to be selected for better performance? Justify. Define slow and fast FH-SS. [8]

OR

- Q6) a)** Define: [8]
- i) Chip period.
- ii) Process gain.
- Determine the processing gain and jamming margin for DS-SS system with  $T_b = 1\text{m sec}$  and  $T_c = 1\mu\text{ sec}$ .
- b) Write note on: [8]
- i) Properties of PN sequence.
- ii) CSMA.

- Q7) a)** For following modulation schemes plot spectral response and draw signal space diagrams. Assume that  $T_b = 1/f_c$  carrier signal has peak amplitude of 1v. [8]
- i) Binary ASK.
- ii) Binary PSK.
- b) What is OQPSK? [6]
- c) Enlist advantages and limitations of M-ary modulation technique. [4]

OR

- Q8) a)** Describe QAM system in detail. Compare it's performance with that of QPSK. [8]
- b) For a given data [101101], draw the modulated output waveforms for
- i) BPSK.
- ii) DPSK.
- iii) QPSK. [6]
- c) Briefly describe the factors involved in defining the probability of error of digital carrier modulation scheme. [4]

