

2011

**DIGITAL COMMUNICATION**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) In PCM, the quantization noise depends on

- a) sampling rate
- b) number of the quantization levels
- c) signal power
- d) none of these.

ii) Quantization noise occurs in

- a) PAM
- b) PWM
- c) DM
- d) none of these.

iii) The main advantage of DM over PCM is

- a) less bandwidth
- b) less power
- c) better S/N ratio
- d) simple circuitry.

- iv) For the code  $X = (000, 111)$  how many errors can be successfully detected ?
- a) 1                                      b) 2  
c) 3                                      d) 0.
- v) What is the efficiency of a (7, 4) block code ?
- a) 3/7                                      b) 3/4  
c) 4/7                                      d) 4/3.
- vi) The standard data rate of a PCM voice channel is
- a) 8kbps                                      b) 8bps  
c) 16bps                                      d) 64 kbps
- vii) PCM generation requires a LPF at the beginning because to
- a) eliminate aliasing effect  
b) eliminate quantization noise  
c) eliminate decoding noise  
d) None of these.
- viii) In TI carrier system one frame duration equals
- a) 128  $\mu$ s                                      b) 125  $\mu$ s  
c) 500  $\mu$ s                                      d) 800  $\mu$ s.
- ix) Which one is digital modulation ?
- a) AM    b) FM  
c) PCM    d) PAM.
- x) How many bits would be required to represent a 256 level quantization in PCM ?
- a) 6    b) 8  
c) 5    d) 7.
- xi) In 30 channels PCM bit rate is
- a) 2.033 Mbps                                      b) 2.048 Mbps  
c) 2.162 Mbps                                      d) 2.248 Mbps.

- xii) Which multiplexing technique transmit digital signal ?
- a) FDM
  - b) TDM
  - c) WDM
  - d) Both ( a ) and ( b ).

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.

3 × 5 = 15

- 2. What do you mean by non-linear quantization ? What type of compressor characteristics is used in waveform coding technique ? 2 + 3
- 3. Why is synchronization used in TDM system ? 5
- 4. Design generation and degeneration of BPSK. 5
- 5. Why is step size controller used in ADM technique ? 5
- 6. What do you mean by ISI ? How is it reduce ? 2 + 3

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.

3 × 15 = 45

- 7. a) The spectral range of a bandpass signal extends from 10 MHz to 10.4 MHz. Find the minimum sampling rate.
- b) Define quantization & quantization error. What are the different types of quantization ?
- c) Draw the block diagram of a DPCM system & explain it.

4 + 4 + 7

8. a) A binary data stream 0010010011 is to be transmitted using DPSK. Show the generation & detection of the DPSK signal by a table.
- b) Explain the generation & detection of a PSK signal. 7 + 8
9. a) Explain TDM-PCM system.
- b) What is pulse stuffing 10 + 5
10. a) What are Hamming Codes ? What are the properties of Hamming Codes ? Write the advantages and disadvantages of Cyclic Codes.
- b) The parity check matrix of a (7, 4) Hamming code is expressed as under :

$$H = \begin{bmatrix} 1 & 1 & 1 & 0 & : & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & : & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 & : & 0 & 1 & 1 \end{bmatrix}_{3 \times 7}$$

Evaluate the syndrome vector for single bit errors.

(2 + 2 + 3) + 8

11. Write short notes on any *three* of the following : 3 × 5

- a) Eye Pattern
- b) Equalizers
- c) Matched Filter
- d) Time Division Multiplexing (TDM)
- e) MSK.