[5058] - 352

## T.E. (Electronics Engg.)
## DATA COMMUNICATION
## (2012 Pattern) (End Sem.) (304202)

*Time : 2½ Hours]*                                                      *[Max. Marks :70*

*Instructions to the candidates:*

*1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*

*2) Neat diagrams must be drawn wherever necessary.*

*3) Figure to the right indicate full marks.*

*4) Assume suitable data if necessary.*

**Q1)** a) What are the limitations of DM? Explain with suitable waveforms. **[6]**

b) Draw and explain Layered architecture of OSI model. **[7]**

c) A 1 kHz signal of voice channel is sampled at 4 kHz using 12 bit PCM. Obtain the followings. **[6]**

  i) Nyquist rate

  ii) BW required

  iii) SNR at PCM output

### OR

**Q2)** a) Compare ARQ and FEC. **[6]**

b) Consider a sinewave of frequency $f_m$ and amplitude $A_m$ applied to a DM of step size $\delta$. Show that the slope over load distortion will occure if

$$A_m > \frac{\delta}{2\pi f_m T_s}$$

Where $T_s$ is the sampling period. **[7]**

c) Compare RZ unipolar, RZ polar and RZ bipolar data formats. **[6]**

**Q3) a)** Apply Shannan-Fano coding procedure for the following message ensemble. Also determine its efficiency. **[8]**

| $x$ | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $x_6$ |
|-----|-------|-------|-------|-------|-------|-------|
| P | 0.4 | 0.28 | 0.12 | 0.08 | 0.08 | 0.04 |

**b)** Find the rate of information transmission across the channel shown in the figure below for P = 0.8 and P = 0.6. The symbols are generated at the rate of 1000 per second. Also determine channel input information rate.

Given $P(x_0) = P(x_1) = \frac{1}{2}$. **[8]**
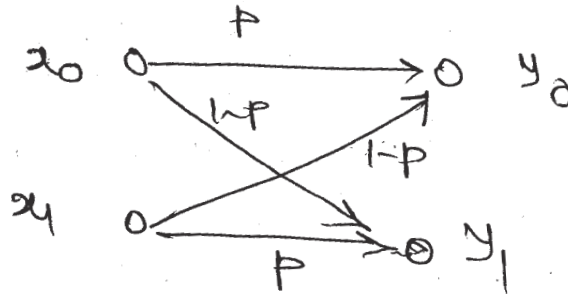


OR

**Q4) a)** The voice frequency modulating signal of a PCM system is to be quantized in 16 levels with following probabilities. **[8]**

$P_1 = P_2 = P_3 = P_4 = 0.1$

$P_5 = P_6 = P_7 = P_8 = 0.05$

$P_9 = P_{10} = P_{11} = P_{12} = 0.075$

$P_{13} = P_{14} = P_{15} = P_{16} = 0.025$

Calculate the entropy and information rate, Assume $F_m = 3kH_z$.

**b)** What steps are involved in Huffman coding procedure? Evaluate the performance of Huffman code over Shannon Fano code for large mesage ensemble with equal probabilities. **[8]**

**Q5) a)** Explain QPSK modulation and demodulation. **[8]**

**b)** Derive the expression of error probability of ASK. **[8]**

OR

**Q6)** a) What is OFDM? Explain its working and give its application. **[8]**

b) For BPSK explain. **[8]**

    i) Generation

    ii) Reception

    iii) Spectrum

    iv) BW

**Q7)** a) Compare FDMA, TDMA and CDMA. **[6]**

b) Compare FH-SS and DS-SS. **[6]**

c) For DS- SS define. **[6]**

    i) Chip sequence

    ii) Chip period

    iii) Processing gain (spread factor)

<div align="center">OR</div>

**Q8)** a) Write a short note on CSMA. **[6]**

b) Write a short note on FH - SS **[6]**

c) Compare through puts of pure ALOHA and slotted ALOHA. **[6]**

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