May 2016

[4958] - 1052

T.E. (Electronics)

DATA COMMUNICATION

(2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :-

1) Figures to the right indicate full marks.
2) Assume suitable data, if necessary.
3) Neat diagrams must be drawn wherever necessary.
4) Use of non programmable electronic pocket calculators is allowed.

Q1) a) Explain the OSI reference Model. [6]

b) A rate 1/3 convolution encoder has generating vectors as $g1 = (1\ 0\ 0)$, $g2 = (1\ 1\ 1)$ and $g3 = (1\ 0\ 1)$. Sketch the encoder configuration and draw trellis diagram. [4]

OR

Q2) a) Compare linear block codes and convolution codes. [6]

b) Compare quantization noise and S/N ratio in PCM & DM. [4]

Q3) a) Draw basic line codes for 11001010. [6]

b) Explain bit synchronization frame synchronization. [4]

OR

Q4) a) Explain different techniques to recover carrier in coherent digital CW communication systems. [4]

b) Construct a systematic (7, 4) cyclic code using the generator polynomial $g(x) = x^3 + x + 1$. What are the error correcting capabilities of this code? Construct the decoding table and for the received codeword 1101100, determine the transmitted code. [6]

Q5) a) An analog signal having 4 kHz bandwidth is sampled at 1.25 times the nyquist rate and each sample is quantized into one of 256 equally likely levels. Assuming samples to be statistically independent. Calculate the S/N ratio and bandwidth required for error free transmission over AWGN channel with a bandwidth of 10 kHz and S/N ratio of 20dB. **[8]**

b) Explain Shannon-Fano algorithm. **[8]**

OR

Q6) a) Explain in detail the Joint entropy and conditional entropy. **[8]**

b) For the channel whose matrix is given below **[8]**

$$P(Y/X) = \begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.2 & 0.6 & 0.2 \\ 0.2 & 0.2 & 0.6 \end{bmatrix}$$

Find I (X; Y) and channel capacity, given the input symbols occur with equal probability.

Q7) a) Derive the expression for spectrum of BPSK system and explain the coherent detection of BPSK. **[8]**

b) In a QPSK system the bit rate of NRZ stream is 10 Mbps and carrier frequency is 1 GHz. Find the symbol rate of transmission and bandwidth requirement of the channel. Sketch the power spectral density of the QPSK signal. **[10]**

OR

Q8) a) In a digital CW communication system, the bit rate of NRZ data stream is 1 Mbps and carrier frequency of 100 MHz. Compute the symbol rate of transmission and the bandwidth requirement of channel for following system and comment. **[10]**

i) BPSK   ii) QPSK

b) Explain QPSK modulator with neat block diagram. **[8]**

Q9) a) Explain different random access methods. [8]

b) Explain slow & fast frequency hopping. [8]

OR

*Q10)*a) Compare spread spectrum methods. [8]

b) A DS-SS BPSK system has $r_b = 3$ kbps, $N_o = 10^{-10}$ W/Hz and is received with $P_e = 10^{-7}$. Calculate processing gain needed for the system to achieve $P_e = 10^{-6}$ in the presence of a single tone jammer whose received power is ten times larger than the correct signal. [8]

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