Total No. of Questions : 8]

SEAT No. :

PA-1484

[Total No. of Pages : 2

[5926]-103
T.E. (E & TC)
DIGITAL COMMUNICATION
(2019 Pattern) (Semester - I) (304181)

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

Instructions to the candidates:

1) ***Answer any one Question out of Q. No. 1 or 2, Q.3 or 4, Q5 or Q6 and Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data; if necessary.***

Q1) a) With neat schematic describe QAM transmitter and Receiver. **[8]**

b) Compare M-ary PSK and M-ary QAM. **[9]**

OR

Q2) a) With the help of block diagram, frequency spectrum and signal space diagram explain M-ary FSK. **[8]**

b) What is need of continuous PSK? With neat schematic and waveforms describe Minimum Shift Keying (MSK). **[9]**

Q3) a) With neat block schematic and waveforms explain DSSS generation and detection. **[8]**

b) Define: **[2]**

i) Processing Gain

ii) Jamming Margin

c) A coherent BPSK - DSSS is used to transmit data at 250 bps with probability of error of 5×10^{-5}. Determine minimum chipping rate, if the jamming signal is 300 times stronger than the received signal. **[8]**

OR

Q4) Write short note on (6 M each) : **[18]**

a) PN sequence properties.

b) FHSS.

c) Ranging using DS spread spectrum.

P.T.O.

Q5) a) Apply Shannon-Fano coding procedure for the following message ensemble to find maximum coding efficiency with M = 2. **[8]**

[X] = [$x1$ $x2$ $x3$ $x4$ $x5$ $x6$ $x7$ $x8$]

[P] = [1/4 1/8 1/16 1/16 1/16 1/4 1/16 1/8].

b) Find mutual information and channel capacity for a given channel with

$$\left[P(Y/X)\right] = \begin{bmatrix} 0.8 & 0.2 \\ 0.3 & 0.7 \end{bmatrix}$$ and p($x1$) = 0.6 and p($x2$) = 0.4. **[9]**

OR

Q6) a) Apply Huffman coding procedure for the following message ensemble to find maximum coding efficiency with M = 2. **[8]**

[X] = [x1 x2 x3 x4 x5 x6 x7]

[P] = [0.4 0.2 0.12 0.08 0.08 0.08 0.04]

b) Define and also write mathematical expression for the following terms, **[9]**

i) Entropy ii) Information rate

iii) Mutual Information iv) Shannon Hartley theorem

Q7) a) The generator matrix for (6, 3) linear block code is given below. Find all code vector. Calculate syndrome for C4: **[9]**

i) without error

ii) if 4th bit is having error

$$G = \left[\begin{array}{ccc:ccc} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 \end{array}\right]$$

b) Explain Turbo Encoder and Decoder with neat schematic and state need of interleaver in turbo codes. **[9]**

OR

Q8) a) Define and Explain following terms, **[10]**

i) Hamming distance ii) Hamming weight

iii) Code rate iv) Constraint length

v) Generator polynomial

b) Write short note on, (4 M each) **[8]**

i) Cyclic codes ii) LDPC Codes