Total No. of Questions : 8]

SEAT No. :

PC1773

[Total No. of Pages : 3

[6353]-92

T.E. (Electronics & Telecommunication Engineering)

DIGITAL COMMUNICATION

(2019 Pattern) (Semester - I) (304181)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is QAM? Draw and Explain Block diagram of generation and reception of the QAM. **[8]**

b) Calculate bandwidth requirement and minimum separation (Euclidean distance) of Signal points in signal space for

i) 16-PSK

ii) 16-FSK

iii) 16-QAM. Given that input bit rate is 8kbps and bit energy is 1×10^{-4}J. **[9]**

OR

Q2) a) What is M-ary FSK? Draw and Explain Block diagram of generation and reception of the M-ary FSK. **[8]**

b) What is OFDM? Draw and Explain block diagram of generation and reception of the OFDM. **[9]**

Q3) a) What is PN sequence? Explain properties of PN sequence. **[9]**

b) A DS-SS BPSK system has fb=3kbps, $N0=10^{-10}$ *w/Hz* and is receiving signals with Pe = 10^{-7} in the presence of single tone jammer whose received power is ten times larger than original signal. Calculate the jamming margin. Assume Q(5.2) = 10^{-7}. **[9]**

OR

P.T.O.

Q4) a) Write a short note on following. **[9]**

i) Slow FHSS

ii) Fast FHSS

b) Explain DSSS BPSK system in detail. **[9]**

Q5) a) Explain binary symmetric channel in detail and find capacity of channel. **[8]**

b) Apply Shannon-Fano code for following message ensemble and find coding efficiency

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

P = [1/4 1/8 1/16 1/16 1/16¼ 1/16 1/8]. **[9]**

OR

Q6) a) A discrete source transmits messages x_1 and x_2 with probability ¾ and ¼. The source connected to the binary symmetrical Channel with $p(y_1/x_1) = 2/3$. Calculate all entropies and mutual information. **[8]**

b) Apply Huffman coding for the following message ensemble.

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

P = [0.45 0.15 0.1 0.1 0.08 0.08 0.04] and find coding efficiency. **[9]**

Q7) a) For a systematic linear block code, the three parity check digits, are given by

$$C_4 = d_1 \oplus d_2 \oplus d_3$$
$$C_5 = d_1 \oplus d_2$$
$$C_6 = d_1 \oplus d_3$$

[9]

i) Construct Generator Matrix

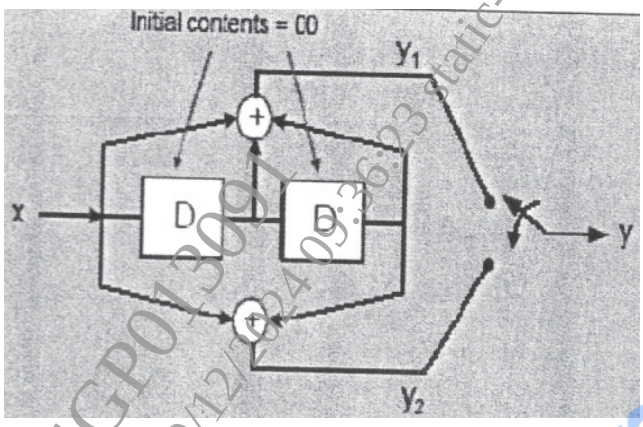
ii) Construct All Code generated by this matrix

iii) Determine error correcting capability

iv) Prepare suitable decoding table

v) Decode the received words 0 0 0 1 1 0

b)



For given convolutional encoder draw three graphical representation. **[9]**

OR

Q8) a) Draw the encoder and syndrome calculator for the generator polynomial $g(x) = 1 + x^2 + x^3$ and obtain the syndrome for the received codeword 1 0 0 1 0 1 1. **[9]**

b) Explain properties of Linear Block code and Cyclic Code with example. **[9]**

* * *