

(3 Hours)

[Total Marks: 80]

N.B.:

- (1) Question No 1 is Compulsory.
- (2) Attempt any three questions out of the remaining five.
- (3) All questions carry equal marks.
- (4) Assume suitable data, if required and state it clearly.

QP-10066029

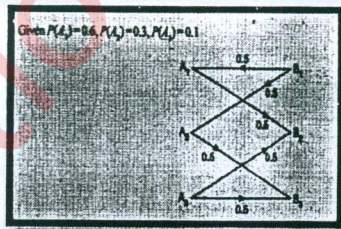
Q1. Attempt any Four:-

- |   |    |
|---|----|
| (a) What is the significance of AWGN Channel?                                       | 05 |
| (b) Explain Shannon Hartley Channel Capacity theorem.                               | 05 |
| (c) Explain Eye pattern.  | 05 |
| (d) Compare BPSK and DPSK.  | 05 |
| (e) Explain use of integrate and dump filter for the reception of a digital signal. | 05 |

Q2 a) Explain Central Limit Theorem 10

Q2 b) Explain the terms random variables, CDF, PDF, mean and variance with example 10

Q3 a) Given below is the noise characteristics of the channel; determine the rate of information and mutual information. The source emits 3000 symbols once every second. 10



Q3 b) A source emits letters from an alphabet  $A = \{m, n, o, p, q\}$  with probabilities  $\{0.1, 0.3, 0.3, 0.15, 0.15\}$  respectively. Find Shannon Fano code. Find Huffman code.

Compare average length and redundancies for both the codes. 10

Q4 a) To transmit a bit sequence 10011011, draw the resulting waveforms using:

- |                |                  |                 |            |
|----------------|------------------|-----------------|------------|
| i) Unipolar RZ | ii) Unipolar NRZ | iii) Bipolar RZ | iv) AMI RZ |
| v) Manchester  |                  |                 |            |

10

Q4 b) What is ISI? Explain effect of ISI in digital communication system. Explain causes of ISI and remedy to reduce the ISI. 10

Q5 a) Draw the block diagram of MSK transmitter. Why MSK is called shaped QPSK. 10

Q5 b) Write the mathematical expression of DPSK transmitted signal and explain DPSK transmitter and receiver. Draw DPSK waveform for the sequence, 1 0 1 1 0 0 1 1 1 0 1 0. 10

Q6 a) For a systematic linear block code three parity check digits  $C_4$ ,  $C_5$  and  $C_6$  are given by,

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

$$C_5 = d_1 \oplus d_2$$

$$C_6 = d_1 \oplus d_3$$

i) Construct generator matrix

ii) Construct code generated by this matrix

iii) Determine error correcting capability

iv) Prepare a suitable decoding table

v) Decode the received words 101100 and 000110. 10

Q6 b) Consider (7,4) cyclic code generated by  $G(p) = x^3 + x + 1$ . 10

i) Draw the hardware arrangement of cyclic encoder and verify the encoder by considering two different messages.

ii) If received code vector is 1001101 and 1101101 find out transmitted code vectors.

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