Total No. of Questions : 8]

SEAT No. :

P3366

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T.E. (E & TC)

INFORMATION THEORY,CODING AND COMMUNICATION NETWORKS

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) A source emits 1000 symbols per second from a range of 5 symbols, with probabilities $\left[\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{16}\right]$. Find entropy and information rate. **[6]**

b) For a systematic (6,3) LBC, the parity matrix is given by **[7]**

$$P = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

i) Find all possible code vectors

ii) Find error detecting & correcting capabilities.

c) Obtain generator matrix and parity check matrix for (7,4) cyclic code using generator polynomial $g(x) = x^3 + x + 1$ **[7]**

OR

Q2) a) What is mutual information? Calculate all the entropies & mutual information for the channel with channel matrix given as P[y/x] = [0.9,0.1,0;0,0.8,0.2;0,0.3,0.7] **[7]**

Given $P(x_1) = 0.3$ and $P(x_2) = 0.25$

$P(x_3) = 0.45$

P.T.O.

b) State & Explain **[6]**

i) Shannon's channel coding theorem

ii) Shannon's Information capacity theorem

c) Explain the cyclic property of cyclic code. Generate a systematic (7,4) cyclic code for the messages **[7]**

i) 1010

ii) 1000

Q3) a) For a 1/3 rate convolutional encoder using three generators **[10]**

$g_1 = [1\ 0\ 0]$

$g_2 = [1\ 0\ 1]$

$g_3 = [1\ 1\ 1]$

i) Sketch the encoder configuration.

ii) Draw state and Terllies diagram

iii) Find output code sequence for the input sequence 10110

b) Find the generator polynomial for the BCH code with block length n = 15, for error correcting capability tc = 2.

Use primitive polynomial $p(x) = x^4 + x + 1$, over GF (2^4) **[8]**

OR

Q4) a) Design (7,3) RS double error correcting code. Use primitive polynomial over GF (2^3), $x^3 + x + 1$.

Find systematic RS code for the message $\{\alpha, \alpha^3, \alpha^5\}$ **[10]**

b) Define the following terms related to convolutional code with example

i) Constraint length

ii) Code rate

iii) Free length

iv) Coding gain **[8]**

Q5) a) Draw & Explain OSI network model. What is peer to peer process? **[8]**

b) What is network? Explain different types of network topologies. **[8]**

OR

Q6) a) Draw & explain TCP/IP reference model.Explain functionality of each layer. **[8]**

b) Compare coaxial cable, Twisted pair cable and fibre optic cable. **[8]**

Q7) a) Draw the HDLC frame format. Explain the control field used in HDLC for different frame types. **[8]**

b) Explain functions of data link layor. **[8]**

OR

Q8) a) List different framing methods. Explain character stuffing and bit stuffing in DLL **[8]**

b) What is ARQ ? Explain Go back N and selective repeat ARQ protocols. **[8]**