

Total No. of Questions : 8]

SEAT No. :

P2957

[Total No. of Pages : 3

[5669]-547

T.E. (E & TC)

**INFORMATION THEORY CODING AND COMMUNICATION
NETWORKS**

(2015 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume Suitable data if necessary.*
- 5) *Answer questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*

Q1) a) A discrete source emits messages x_1 & x_2 with probabilities $\frac{3}{4}$ & $\frac{1}{4}$ with BSC. (Binary Symmetric Channel). Find $H(x)$, $H(y)$, $H(xy)$. Also find mutual information. For prob $P = \frac{1}{3}$ (Error probability). Draw channel diagram. [7]

b) Define and give example. [7]

- a) Hamming weight
- b) Hamming distance
- c) Code rate
- d) Min hamming distance

c) Write properties of Galois field write addition and multiplication table for GF(7) [6]

OR

Q2) a) A discrete memory less source has 4 symbols x_1, x_2, x_3, x_4 with probabilities. 0.3, 0.2, 0.4 and 0.1 respectively. Construct Huffman code, calculate code efficiency and redundancy. [7]

P.T.O.

- b) For (6,3) systematic linear code, the three parity digits are given by $c_4 = m_1 \oplus m_2$, $c_5 = m_1 \oplus m_2 \oplus m_3$ and $c_6 = m_1 \oplus m_3$. [7]

- i) Determine generator matrix.
- ii) Comment on error detection & correction ability of code.
- iii) If received sequence is 101101. Determine message word.

- c) Draw cyclic encoder structure for systematic (7,4) code with $g(x) = 1 + x^2 + x^3$. Obtain code word for message [1001] [6]

- Q3) a)** Define following terms related to convolutional codes with example. [8]

- i) Constraint length
- ii) Code rate
- iii) Dfree (free length)
- iv) Generating function

- b) Design (15,11) Rs code. Find code for message polynomial $(x + 1)$. Use primitive polynomial $P(x) = x^4 + x + 1$. [10]

OR

- Q4) a)** For systematic rate $\frac{1}{2}$ convolutional encoder with constraint length 2. parity bit is generated by mod-2 sum $p = x + 1$. [8]

- i) Draw the encoder
- ii) Draw state diagram, trellis diagram
- iii) Find out the output for message (1 0 1)

- b) Consider (15,7) double error correcting BCH code with $g(x) = x^8 + x^7 + x^6 + x^4 + 1$ and received code word $C = [0\ 0\ 0\ 0\ 0\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 0\ 1\ 1]$. Find the corrected codeword. Use primitive polynomial $x^4 + x + 1$. [10]

- Q5) a)** Draw & explain TCP/IP model. Explain functionality of each layer. [8]

- b) Compare coaxial cable, optical fibre and twisted pair cable. [8]

OR

Q6) a) Define network. Explain different network topologies. [8]

b) Explain network design issues. [8]

Q7) a) Give functions/services of DLL. Compare it with physical layer. [8]

b) What is framing? Explain diff. types of framing methods. [8]

OR

Q8) a) What is ARQ? Explain three types of ARQ in detail. [8]

b) Explain different types of stations and data transfer modes of HDLC. [8]

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