P2957

[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 in formation. 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 Gallois 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]**

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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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