Total No. of Questions : 6] **SEAT No. :**

P492

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TE/Insem/APR - 19
T.E. (Electronics and Telecommunication)
INFORMATION THEORY AND CODING TECHNIQUES
(Semester - II) (2012 Pattern)

Time : 1 Hour] ***[Max. Marks : 30***

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.***
2) ***Use of calculator is allowed.***
3) ***Assume suitable data if necessary.***

Q1) a) Define following terms in information theory : **[4]**

i) Entropy

ii) Mutual Information

iii) Kraft's Inequality

iv) Channel Capacity

b) Construct the Huffman's and Shannon Fano code for the source probabilities given below. Compare average codeword length and coding efficiency.
P(X) = {0.5, 0.25, 0.09, 0.16} **[6]**

OR

Q2) a) Explain necessity of Source Coding Techniques with various methods of source coding. **[4]**

b) Find entropy H(X), H(Y) and Mutual Information of the channel for which channel matrix is as given below :

$$P\left(\frac{y}{x}\right) = \begin{matrix} 0.6 & 0.4 \\ 0.4 & 0.6 \end{matrix}$$

The source probabilities are given as $P(x_1) = 0.3$ and $P(x_0) = 0.7$ **[6]**

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Q3) a) State Information Capacity Theorem with its significance in digital communication. **[4]**

b) Construct a (7, 4) LBC for a message word (1110) from the parity equations given below. If the third bit in received vector is in error, correct it using Syndrome decoding method. **[6]**

$$p_0 = m_0 + m_1 + m_2$$

$$p_1 = m_0 + m_2 + m_3$$

$$p_2 = m_1 + m_2 + m_3$$

OR

Q4) a) Explain necessity of Channel codes with suitable example. **[4]**

b) For a (6, 3) LBC, Parity Sub - Matrix is given below. Find error detection and correction capacity of this code. Justify that it is a linear code. **[6]**

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

Q5) a) Give the properties of Syndrome Polynomial. **[4]**

b) Find the minimal polynomial of GF(8) whose trans field is GF(2) with primitive polynomial $X^3 + X + 1$. **[6]**

OR

Q6) a) Explain following polynomials in error control codes : **[4]**

i) Minimal Polynomial

ii) Primitive Polynomial

b) Draw encoder and decoder arrangement for (7, 4) Cyclic Code if the generator polynomial is $G(X) = X^3 + X^2 + 1$. **[6]**

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