SEAT No. :

APR - 18/TE/Insem. - 21

T.E. (E & TC)

INFORMATION THEORY AND CODING TECHNIQUES

(2012 Course) (Semester - II)

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

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.*

2) *Assume suitable data, if necessary.*

3) *Use of calculators is allowed.*

Q1) a) An 8 bit PCM system generates 8,000 samples per second. If the quantized samples produced by the systems are equiprobable, what is the rate of transmission of information? **[4]**

b) State Shannon's source coding Theorem. Apply Shannon-Fano coding for following message ensemble and find coding efficiency. **[6]**
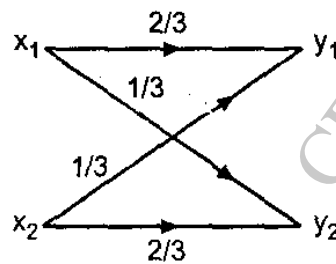
$$[X] = [x_1 \quad x_2 \quad x_3 \quad x_4]$$

$$[p] = [0.4 \quad 0.3 \quad 0.2 \quad 0.1]$$

OR

Q2) a) What is run Length Encoding? Explain with suitable example and application. **[4]**

b) A discrete source transmits messages x_1 and x_2 with probabilities ¾ and ¼. The source connected to the channel given below. Calculate H(X), H(Y) and H(X,Y). **[6]**

Q3) a) If a channel is band limited to 5 kHz and signal-to-noise ratio is 15, find the capacity of channel. **[4]**

b) Find all code words for the linear block code with following generator matrix G = [1 0 1 0; 1 1 0 1] What is error detection and correction capability of the code? **[4]**

c) What is hamming code? Explain in brief. **[2]**

OR

Q4) a) State Shannon's information capacity theorem. What is its significance? **[4]**

b) What is perfect code explain with suitable example. **[4]**

c) What is hamming distance? Explain in brief. **[2]**

Q5) a) What is Finite Field? State any 4 properties of finite field. **[6]**

b) Write the method for generating systematic cyclic code. **[4]**

OR

Q6) a) Find any one minimal polynomial of GF (2^3) whose Transfield is GF(2) with primitive polynomial $x^3 + x + 1$. **[6]**

b) Draw the syndrome generator circuit for a (n,k) cyclic code. **[4]**

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