

Total No. of Questions :6]

SEAT No. :

**P87**

**APR. -16/TE/Insem. - 19**

[Total No. of Pages :2

**T.E.(E & TC)**

**INFORMATION THEORY & CODING TECHNIQUES**

**(2012 Course) (Semester - II)**

*Time : 1Hour]*

*[Max. Marks :30*

*Instructions to the candidates:*

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.
- 2) Use of calculator is allowed.
- 3) Assume suitable data if necessary.

**Q1)** a) What is irreducible or prefix condition for a source code? Explain with example. **[4]**

b) Find  $H(x)$ ,  $H(y)$ ,  $H(x,y)$  and  $I(x,y)$  if the joint probabilities of communication system are given as. **[6]**

$$P(x,y) = \begin{bmatrix} \frac{1}{4} & \frac{1}{4} \\ \frac{1}{4} & \frac{1}{4} \end{bmatrix}$$

OR

**Q2)** a) Write the procedure for Shannon- Fano coding. **[4]**

b) Encode the sequence abaabbbaaa using LZW technique if initial dictionary contains {a, b}. **[6]**

**Q3)** a) Prove that the maximum capacity for a channel with infinite band width will be  $1.44 \times \frac{S}{N_0}$  where S is signal power and  $N_0$  is noise power spectral density. **[6]**

**P.T.O.**

- b) Find the parity check matrix for decoding Linear block code if generator matrix is given as. [4]

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

OR

- Q4)** a) For a (4,2) Linear block code, the generator matrix is given as. [6]

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

Find all code words that can be generated. Comment on error correction capability of the code.

- b) Write a short note on single parity check codes. [4]

- Q5)** a) What is primitive element? Explain with suitable example. [4]

- b) Using generator polynomial  $g(x) = x^3 + x^2 + 1$ , generate systematic cyclic code for following messages. [6]

i)  $[1 \ 0 \ 1 \ 1]$

ii)  $[1 \ 1 \ 1 \ 1]$

OR

- Q6)** a) Find the first 8 elements of  $GF(2^4)$  generated by primitive polynomial [4]

$$p(x) = 1 + x + x^4$$

Hence find  $\alpha^5 \oplus \alpha^6$ .

- b) Draw the encoding & decoding circuit for cyclic code whose generator polynomial is  $g(x) = x^3 + x^2 + 1$ . [6]

