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]**

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

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 $1.44 \times \dfrac{S}{No}$ where S is signal power and No 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]**

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