BUDDHA INSTITUTE OF TECHNOLOGY, GIDA, GORAKHPUR
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CLASS TEST-1 (EVEN SEMESTER 2022-23)
April-2023

Course:B.Tech **Semester: VI**

Subject:Digital Communication **SubjectCode: KEC-601**

M.M.: 30 **Time: 2:00 hrs** **Roll No._____**

SECTION-A

1. Attempt all questions. Each questions carry equal marks. **Marks: 5*1=5**

Q. No.	Question	Level of Taxonomy	Course Outcome
a.	In an experiment, three coins are tossed simultaneously. If the number of heads is the random variable, find the probability function for this random variable.	**Understanding**	**(CO1)**
b.	Explain the term random variable with the help of suitable example.	**Understanding**	**(CO1)**
c.	Determine the constant k such that the function $f_X(x)$ given by the expression $f_X(x) = 1/k$, for $a \le x < b$ $= 0$, elsewhere Is a probability density function. Also, find the cumulative distribution function of the random variable X satisfies the condition for $f_X(x)$ to be a probability density function.	**Applying**	**(CO1)**
d.	Prove that: (i) $H(X,Y) = H(X/Y)+H(Y)$ (ii) $I(X:Y) = H(X) + H(Y) - H(X,Y)$	**Understanding**	**(CO5)**
e.	Discuss the term Information and Entropy.	**Understanding**	**(CO5)**

SECTION-B

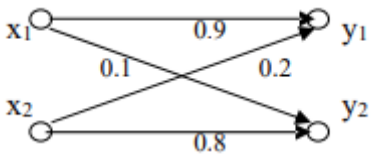
2.Attempt all questions. Each questions carry equal marks. **Marks: 3*5= 15**

Q. No.	Question	Level of Taxonomy	Course Outcome
a.	A random variable X has the uniform distribution given by $F_X(x) = 1/2\pi$ for $0 \le x \le 2\pi$ $= 0$,otherwise Determine m_x , mean square, σ_x. **OR**	**Understanding**	**(CO1)**
a.	A random process provides measurements x between the value 0 and 1 with a probability density function given as $f_X(x) = 12x^3-21x^2+10x$,for $0 \le x \le 1$ $= 0$, otherwise	**Understanding**	**(CO1)**

	Determine the following: (i) P[X≤1/2] (ii) P[X>1/2]		
b.	Identify the (i) Binary & (ii) Ternary Huffman codes for the random variable X with probabilities p=(1/21 , 2/21 , 3/21 , 4/21 , 5/21 , 6/21) . Also calculate the average length in each case. **OR**	**Applying**	**(CO5)**
b.	Explain Huffman code with help of suitable example.	**Applying**	**(CO5)**
c.	Interpret the entropy of the source and sketch its variation for different values of α, if a discrete memory less source there are three symbols with probabilities p1= α and p2=p3.	**Applying**	**(CO5)**

SECTION-C

3.Attempt any all questions. Each questions carry equal marks. **Marks: 2*5=10**

Q. No.	Question	Level of Taxonomy	Course Outcome
a.	Determine the Huffman binary code for the following message with their probabilities and also find efficiency. Symbol: S_1 S_2 S_3 S_4 S_5 S_6 S_7 Probabilities: $\frac{1}{3}$ $\frac{1}{27}$ $\frac{1}{3}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{27}$ $\frac{1}{27}$ **OR**	**Applying**	**(CO5)**
a.	A DMS X have five symbols x1,x2,x3,x4 and x5 with probabilities P(x1)= 0.4,P(x2)=0.19,P(x3)=0.16,P(x4)=0.15 and P(x5)=0.1.Construct Shannon –Fanocode for x and calculate the efficiency of the code.	**Applying**	**(CO5)**
b.	Given a binary channel shown in the figure below  (i) Identify the channel transition matrix. (ii) Identify p(y1) and P(y2) ,when P(x1)=P(x2)=0.5 (iii) Identify H(X),H(Y),H(X,Y),H(X/Y),H(Y/X) and mutual information I(X:Y).	**Applying**	**(CO5)**

Note: Revised Bloom's Taxonomy Levels-

L1->Remembering, L2->Understanding, L3->Applying, L4->Analyzing, L5->Evaluating, L6-> Creating.