KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY
DEEMED TO BE UNIVERSITY, BHUBANESWAR – 24
(Decld. U/S 3 of UGC Act, 1956)

Probability and Statistics

KIIT Deemed to be University
Online Mid Semester Examination(Spring Semester-2022)

Subject Name & Code: MA-2011 **Applicable to Courses: B.Tech (CSSE)**

Full Marks=20 **Time:1 Hour**

SECTION-A(Answer All Questions. All questions carry 2 Marks)
Time:20 Minutes **(5×2=10 Marks)**

Question No	Question Type (MCQ/ SAT)	Question	CO Mapping	Answer Key (For MCQ Questions only)
Q.No:1(a)	MCQ	If are mutually exclusive events with , then a. b. c. is undefined d. is defined	CO1	c
	MCQ	A certain system can experience three different types of defects. Let denote the event that the system has a defect of type. Suppose that . Find the value of a. 0.20 b. 0.15 c. 0.22 d. 0.19	CO1	b
	MCQ	Let A, B and C be three independent events with probabilities , . What is the value of ? a. 0.7842 b. 0.4287 c. 0.8742 d. 0.8642	CO1	c
	MCQ	If probability mass function of the random variable X is , then find to the value of k and . a. and b. and c. and d. and	CO1	b
Q.No:1(b)	MCQ	When the variance of a random variable is , then **a.** 81 **b.** 12 **c.** 27 **d.** 36	CO2	b
	MCQ	A random variable has a Poisson distribution such that Then the standard deviation(S.D) of is **a.** **b.** **c.**	CO2	**c**

<table>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td><u>MCQ</u></td><td>In the following probability distribution list, probability distribution values of the rv X are given as follows
<table>
<tr><td></td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>F(x)</td><td>0.12</td><td>0.28</td><td>0.50</td><td>0.50 $+k$</td><td>0.65 $+k$</td><td>0.77 $+k$</td><td>0.83 +k</td></tr>
</table>
Find the value of .
a. 0.56
b. 0.66
c. 0.67
d. 0.76</td><td>CO2</td><td>b</td></tr>
<tr><td></td><td><u>MCQ</u></td><td>In the following probability distribution, the pmf of the rv X are given as follows
<table>
<tr><td></td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>F(x)</td><td>0.13</td><td>0.28</td><td>0.49</td><td>0.67</td><td>0.83</td><td>0.95</td><td>1</td></tr>
</table>
If find .
a. 0.812
b. 0.721
c. 0.821
d. 0.825</td><td>CO2</td><td>c</td></tr>
<tr><td><u>Q.No:1(c)</u></td><td><u>SAT</u></td><td>The value of the constant , such that defined by

is a probability density function, is</td><td>CO3</td><td>NA</td></tr>
<tr><td></td><td><u>SAT</u></td><td>Find the value of z_α for</td><td>CO3</td><td>NA</td></tr>
<tr><td></td><td><u>SAT</u></td><td>If the rv with number of success and probability of success , then what is the upper bound of ?</td><td>CO3</td><td>NA</td></tr>
<tr><td></td><td><u>SAT</u></td><td>k
Find the value of such that $f(x)=\begin{cases} ke^{-2x}, & x\ge 0 \\ 0, & \text{Otherwise} \end{cases}$ is a probability density function.</td><td>CO3</td><td>NA</td></tr>
<tr><td><u>Q.No:1(d)</u></td><td><u>SAT</u></td><td>Let X be normally distributed with mean 10 and standard deviation is 5. Then evaluate $P(0\le X\le 10)$.</td><td>CO2</td><td>NA</td></tr>
<tr><td></td><td><u>SAT</u></td><td>Find the value of k such that $f(x)=\begin{cases} (1.5-k(x-1.5)^2, & 1<x<2 \\ \\ 0, & \text{Otherwise} \end{cases}$ is a probability density function.</td><td>CO2</td><td>NA</td></tr>
<tr><td></td><td><u>SAT</u></td><td>If the rv has a hypergeometric distribution with . Find the approximate mean and variance of .</td><td>CO2</td><td>NA</td></tr>
<tr><td></td><td><u>SAT</u></td><td>If the random variable X has a Poisson distribution process with parameter . Find mean and standard deviation of .</td><td>CO2</td><td>NA</td></tr>
<tr><td><u>Q.No:1(e)</u></td><td><u>MCQ</u></td><td>Find the value of k such that
$$f(x)=\begin{cases} kx, & 0<x<1 \\ k, & 1<x<2 \\ -kx+3k, & 2<x<3 \\ 0, & \text{Otherwise} \end{cases}$$
is a pdf.</td><td>CO3</td><td>NA</td></tr>
<tr><td></td><td><u>SAT</u></td><td>If the rv then what is the approximated value of ?</td><td>CO3</td><td>NA</td></tr>
<tr><td></td><td><u>SAT</u></td><td>If the rv has a Poisson distribution with parameter and is approximated to normal rv then what is the approximated value of ?</td><td>CO3</td><td>NA</td></tr>
<tr><td></td><td><u>SAT</u></td><td>Let X be normally distributed with mean 10 and standard deviation is 5. Then evaluate $P(5\le X\le 20)$.</td><td>CO3</td><td>NA</td></tr>
</table>

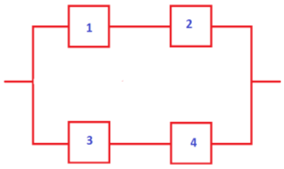
<u>SECTION-B(Answer Any One Question. Each Question carries 10 Marks)</u>

Time: 30 Minutes **(1×10=10 Marks)**

Question No. (Question Bank)	Question	CO Mapping
	Group-1	

Question No:2 — CO1 — (5×2)

Consider the system illustrated in the Figure. There are two subsystems connected in parallel, each one containing two cells. In order for the system to function, at least one of the two parallel subsystem must work. Within each subsystem, the two cells are connected in series, so the subsystem work only if all cells in the subsystem work. Consider a particular life-time value . Let denote the event that the lifetime of the cell exceeds . Assume that 's are independent events. If and the probability that the system lifetime exceeds is 0.98. Find the value of .



A random variable X has the following probability function:

a. Find k so that it will be a legitimate pmf.
b. Evaluate
c.

Question No:3 — CO2 — (5×2)

Find mean and variance of Binomial distribution for a random variable X having number of experiments with probability of success is and probability of failure is .

Find the moment generating function of continuous uniform distribution. Then find the mean and variance.

Question No:4 — (5×2)

A pediatrician wishes to recruit 5 couples, each of whom is expecting their first child, to participate in a new natural childbirth regimen. Let p=P(a randomly selected couple agrees to participate). If p=0.2 what is the probability that 15 couples must be asked before 5 are found who agrees to participate ? That is, with S={agrees to participate}, what is the probability that 10 F's occur before the fifth S?

An ecologist wishes to mark off a circular sampling region having radius m. However, the radius of the resulting region is actually a random variable with pdf

What is the variance area of the resulting circular region?

Group-2

Question No:5 — CO1 — (5×2)

a. Let $X =$ the time between two successive arrivals at the drive-up window of a local bank. If X has an exponential distribution with $\lambda = 1$ (which is identical to a standard gamma distribution with $\alpha = 1$), compute the following:
   i. The expected time between two successive arrivals
   ii. The standard deviation of the time between successive arrivals
   iii. $P(2 \le X \le 5)$.

b. Prove that

Question No:6 — CO2 — (5×2)

a. The weekly demand for propane gas (in 1000s of gallons) from a particular facility is an rv X with pdf

   i. Compute the $\boldsymbol{P(1 < X \le 1.5)}$.

	ii. What is the value of the median? iii. Compute $V(X)$.	
	b. Find the moment generating function of standard normal distribution, then find its mean and variance	
Question No:7	a. If is the normal r.v with ., determine the value of the constant for which .	CO3
	b. Define exponential distribution. Find the probability distribution function, mean, median of exponential distribution.	(5×2)