MANAV RACHNA vidyanatariksha | MANAV RACHNA UNIVERSITY
FORMERLY MANAV RACHNA COLLEGE OF ENGINEERING
NAAC ACCREDITED 'A' GRADE INSTITUTION
Declared as State Private University under section 2f of the UGC act, 1956

DEPARTMENT OF MATHEMATICS

"T2 Examination, March 2020"

Semester: 4th | **Date of Exam: 20/03/2020**
Subject: Probability & Statistics | **Subject Code: MAH202B-T**
Branch: CSE | **Session: 1:00 PM-2:30 PM**
Course Type: Core | **Course Nature: Hard**
Time: 90 Minutes | **Max. Marks: 30**
Program: B. Tech. | **Signature: HOD/Associate HOD:**

PART A

(All questions are compulsory 2*5=10)

1. (a) Show that the bivariate function:

$$F(x,y) = \begin{cases} e^{-(x+y)}, & x \geq 0, y \geq 0 \\ 0, & otherwise \end{cases}$$ is not a joint distribution function.

(b) Define joint distribution function and write Rectangle rule for the same.

(c) If $X \sim Expo(\lambda)$ with $P[X \leq 2] = P[X > 2]$, Find $var[X]$.

(d) If X is normally distributed with mean 2 and variance 1, find $P[|X-2| < 1]$

(e) Define Gamma distribution. Also write mean and variance of the distribution.

PART B

(Attempt any 2 questions. Each question carries 10 marks)

2. (a) In a normal distribution, 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution?

(6 Marks)

(b) If X and Y have joint p.d.f.:

Y \ X	-1	0	1
0	a	2a	a
1	3a	2a	a
2	2a	a	2a

Find (i) marginal distributions of X and Y, (ii) Conditional distribution of X given $Y = 1$.

(4 Marks)

3. (a) Two tetrahedra with sides numbered 1 to 4 are tossed. Let X denote the number on the downturned face of the first tetrahedron and Y the larger of the downturned numbers. Find

(i) The joint density function of X and Y.

(ii) $E[Y|X = 3]$

(iii) $P[X \leq 2, Y \leq 2]$ (6 Marks)

(b) The life of electronic tubes of a certain type may be assumed to be normally distributed with mean 155 hours and standard deviation 19 hours. What is the probability that

(i) The life of randomly chosen tube is between 135 hours and 173 hours.

(ii) The life of randomly chosen tube is less than 116 hours. (4 Marks)

4. (a) Let the joint probability density function of X and Y is given by

$$f(x,y) = \begin{cases} x + y, & where\ 0 \leq x \leq 2, 0 \leq y \leq 1 \\ 0, & otherwise \end{cases}$$

Find (i) $P[0 < X < \frac{1}{2},\ 0 < Y < \frac{1}{3}]$ (ii) $E[X + Y]$ (iii) $\rho[X, Y]$ (6 Marks)

(b) If X has an exponential distribution with mean 2, Find $P(X < 1|\ X < 3)$. (4 Marks)