

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

Part- A

(25 Marks)

1.a) If X is a continuous random variable has the probability density

$$f(x) = kxe^{-x^2}, x > 0$$

= 0, $x \leq 0$, then find the value of k. [2]

b) If X is a continuous random variable whose probability density function is given by

$$f(x) = \begin{cases} \frac{1}{3}, & -1 < x < 2 \\ 0, & \text{else where} \end{cases}$$

Find the moment generating function. [3]

c) If the two lines of regression are $y = 0.8x + 1.2$ and $x = 0.4y + 1$, then find the means of x and y. [2]

d) The joint probability density function is given by

$$f(x) = \begin{cases} x+y, & 0 < x < 1, 0 < y < 1 \\ 0, & \text{elsewhere} \end{cases}$$

Find the Conditional P.D.F of Y given X. [3]

e) Define i) one tail test ii) Two tail test. [2]

f) Maximum error = 5 and the standard deviation = 80 with 95% confidence, then find the sample size. [3]

g) Define i) queue ii) The service discipline [2]

h) Define i) Balking ii) Reneging iii) Jockeying. [3]

i) Define regular Marcov chain. [2]

j) If $\begin{bmatrix} 0.2 & x & 0.2 \\ 0.1 & 0 & x+y \\ z & 0.2 & 0.1 \end{bmatrix}$ is a transmission probability matrix, then find the values of x, y and z. [3]

Part-B

(50 Marks)

2.a) Assuming that half the population are consumers of rice. If 8 individuals are taken to test. Find the probability that

i) Two are consumers of rice.

ii) At least two are consumers of rice.

b) The marks obtained in mathematics by 1000 students is normally distributed with mean 78% and standard deviation 11%. Determine How many students got marks above 90%? [5+5]

OR

- 3.a) The average number of phone calls/minute coming into a switch board between 12pm and 4pm is 2.5. Determine the probability that during one particular minute there will be i) 4 or fewer ii) More than 6 calls.
- b) Find the probability of getting 1 or 4 or 5 or 6 in throwing a die 5 to 7 times among 9 trials using normal distribution. [5+5]

4. The Joint Probability distribution of X and Y is

Y →	0	1	2	Total
X ↓				
0	3/28	9/28	3/28	15/28
1	3/14	3/14	0	12/28
2	1/28	0	0	1/28
Total	10/28	15/28	3/28	1

- Find
- Marginal probabilities for x
 - Marginal probabilities for y
 - $E(X)$
 - $E(Y)$

[10]

5. Calculate the coefficient of correlation between the two variables x and y. [10]

x	2	3	8	11	4	5	9	7	5	7
y	21	42	102	130	52	57	105	85	62	90

6. A random sample of 10 bags of pesticides are taken whose weights are 50, 49, 52, 44, 45, 48, 46, 45, 49, 45 (in kgs). Test whether the average packing can be taken to be 50 kgs. [10]

7. The following table gives the number of aircraft accidents that occurred during the six days of the week. Find whether the accidents are uniformly distributed over the week. [10]

Days	Mon	Tue	Wed	Thu	Fri	Sat
No. of Accidents	14	18	12	11	15	14

8. Derive formulae To find the expected number of units in the system and To find the expected number of units in the queue. [10]

9. A fast food restaurant has one drive window. Cars arrive according to a poisson process. Cars arrive at the rate of 2 per 5 minutes. The service time per customer is 1.5 minutes. Determine

- The Expected number of customers waiting to be served.
- The probability that the waiting line exceeds 10
- Average waiting time until a customer reaches the window to place an order.
- The probability that the facility is idle. [10]