

10. Write down the ANOVA table for the Latin square design.

PART B (5 × 16 = 80 Marks)

11. (i) If

$$f(x) = \begin{cases} xe^{-x^2/2}, & x \geq 0 \\ 0 & x < 0 \end{cases}$$

show that $f(x)$ is a p.d.f. of a continuous random variable and find its cumulative distributive function.

(8 marks)

(ii) A bolt is manufactured by 3 machines A, B and C. A turns out twice as many items as B, and machines B and C produce equal number of items. 2% of bolts produced by A and B are defective and 4% of bolts produced by C are defective. All bolts are put into 1 stock pile and one is chosen from this pile. What is the probability that it is defective?

(8 marks)

12. (a) i. Find the mean and variance of a Poisson random variable. (8 Marks)

ii. Trains arrive at a station at 15 minutes intervals starting at 4 a.m. If a passenger arrive at a station at a time that is uniformly distributed between 9.00 and 9.30, find the probability that he has to wait for the train for (i) less than 6 minutes (ii) more than 10 minutes.

(8 Marks)

(OR)

(b) i. State and prove the memoryless property of a geometric distribution.

(8 Marks)

ii. In a class of students, the heights of the students is normally distributed. Six percent have height below 60 inches and 39 percent are between 60 and 70 inches. Find the mean and standard deviation of height.

(8 Marks)

13. (a) i. The joint p.d.f. of two random variables X and Y is given by

$$f(x, y) = \begin{cases} 24xy, & x > 0, y > 0, x + y \leq 1 \\ 0, & \text{otherwise.} \end{cases}$$

Find the conditional mean and variance of Y given X . (8 Marks)

ii. Let X and Y be random variables with the joint distribution given in the following table:

	-3	2	4	sum
1	0.1	0.2	0.2	0.5
3	0.3	0.1	0.1	0.5
sum	0.4	0.3	0.3	

(a) Find the marginal distributions of X and Y

(b) Find the $Cov(X, Y)$.

(8 Marks)

(OR)

(b) The joint variables X and Y is given by

$$0 \leq x \leq 1, 0 \leq y \leq 1$$

independently

Find Y on X and the regression line of X on Y .

(16 marks)

14. (a) i. Find selectivity of 190 radio receivers produced the following table:

		Fidelity		
		Low	Average	High
Selectivity	Low	6	12	32
	Average	33	61	18
	High	13	15	0

Use significance to test whether there is a relationship (dependence) between fidelity and selectivity. (8 Marks)

ii. The following samples are measurements of the heat producing capacity (calories per ton) of specimens of coal from two mines:

260	8,130	8,350	8,070	8,340	
950	7,890	7,900	8,140	7,920	7,840

Assume the population sampled can be approximated closely with normal distribution having the same variance, test the null hypothesis $\mu_1 = \mu_2$ against the alternative hypothesis $\mu_1 - \mu_2 \neq 0$ at the 0.01 level of significance. (8 Marks)

(OR)

(b) i. Fit a Poisson distribution to the following data and also test the goodness of fit at the 5% level of significance.

x	0	1	2	3	4	5	6
f	5	18	28	12	7	6	4

(8 Marks)

ii. The following are the number of sales which a sample of 9 salespeople of industrial California and a sample of 6 sales people of industrial Oregon made over a certain fixed period of time:

59	68	44	71	63	46	69	54	48
50	36	62	52	70	41			

Test at the 5% level of significance whether it is reasonable to assume that the two populations sampled are equal.

(8 marks)