

Time: 3 Hours

Max. Marks: 80

- N.B.:** 1) Question No.1 is **compulsory**.
 2) Attempt any **three** from the remaining **five** questions.
 3) Figures to the right indicate full marks.
 4) Scientific Calculator is allowed.

- Q.1** (a) The number of scooter accidents per month in a certain town were as follows: **05**
 12, 8, 20, 2, 14, 10, 15, 6, 9, 4
 Are these frequencies in agreement with the belief that accident conditions were the same during this 10 month period?

[Given the table value of χ^2 at 5% level of significance for 9 degrees of freedom is 16.919]

- (b) Find the probability that in 5 tossings, a perfect coin turns up head at least 3 **05**
 times in succession.
 (c) Let X be a random variable for which $E(X)=10$ and $V(X)=25$. Find the values **05**
 of a and b such that $Y= aX-b$ has expectation zero and variance 1.
 (d) Find the Spearman's Rank Correlation coefficient for the following data **05**

| | | | | | | | | | |
|------------------|----|----|----|---|----|----|----|----|----|
| Marks in MFCS1 | 35 | 47 | 23 | 6 | 17 | 10 | 43 | 9 | 28 |
| Marks in Ad.Java | 30 | 46 | 33 | 4 | 23 | 8 | 48 | 12 | 31 |

- Q.2** (a) In a bolt factory, machines A, B, C manufacture respectively 25%, 35% and **10**
 40% of the total. Of their output 5,4,2 percent are known to be defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by
 (i) Machine A (II) Machine B or C

- (b) Calculate Karl Pearson's coefficient of skewness for bursting pressure **10**

| | | | | | | | |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|
| Bursting pressure(in lb) | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 | 45-50 | 50-55 |
| No. of bags | 8 | 12 | 20 | 25 | 15 | 12 | 8 |

- Q.3** (a) Following data represents assets of a multinational company in crores of rupees **10**
 during year 1981-1990.

| | | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|
| Year | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
| Asset | 60 | 69 | 81 | 86 | 78 | 93 | 102 | 107 | 100 | 109 |

Find the regression of asset on year. Estimate the asset for the year 1992. Also find Karl Pearson's Coefficient of correlation.

- (b) In order to make a survey of the buying habits, two markets A and B are chosen **10**
 at two different part of city. 400 women shoppers are chosen at random in market A. Their average daily expenditure on food is found to be Rs. 250 with a standard deviation of Rs. 40. The figures are Rs. 220 and Rs. 55 respectively in the market B where also 400 women shoppers are chosen at random. Test at 1% level of significance (2.58) whether the average daily food expenditures of two populations of shoppers are equal.

- Q. 4** (a) The joint probability density function of a two dimensional random variable (X,Y) is given by **10**

$$f(x,y)=2, \quad 0 < x < 1, \quad 0 < y < x.$$

- (i) Find the marginal density function of X and Y.
 (ii) Find the conditional density functions of y on x and x on y
 (iii) Check for independence of X and Y

- (b) A radio shop sells, on an average 200 radios per day with a standard deviation of 50 radios. After an extensive advertising campaign, the management will compute the average sales for the next 25 days to see whether an improvement has occurred. Assume that the daily sales of radios is normally distributed. **10**

- (i) Write down the null and alternative hypothesis.
 (ii) test the hypothesis at 5% level of significance if X mean = 216.
 (III) How large must X mean be in order that the null hypothesis is rejected at 5% level of significance.
 (5% level of significance is 1.645)

- Q. 5** (a) Compute the quadratic regression equation of following data **10**

| | | | | | | | |
|---|-----|----|-----|---|---|---|----|
| X | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| Y | 7.5 | 3 | 0.5 | 1 | 3 | 6 | 14 |

- (b) For the following bivariate probability distribution of X and Y, find **10**
- (i) $P(X \leq 1, Y = 2)$ (ii) $P(X \leq 1)$ (III) $P(Y = 3)$ (iv) $P(Y \leq 3)$,
 (V) $P(X < 3, Y \leq 4)$

- Q. 6** (a) The mean and standard deviation of the wages of 6000 workers engaged in a factory are Rs. 1200 and Rs. 400 respectively. Assuming the distribution to be normal estimate: **10**

- (i) Percentage of workers getting wages above Rs. 1600
 (ii) Number of workers getting wages between Rs. 600 and Rs.900
 (iii) Number of workers getting wages between Rs. 1100 and Rs. 1500

Te relevant extract of the Area table from Z=0 to Z=z is given below:

| | | | | | | | |
|------|--------|--------|--------|--------|--------|--------|--------|
| Z | 0.25 | .5 | .6 | .75 | 1.00 | 1.25 | 1.5 |
| Area | 0.0987 | 0.1915 | 0.2257 | 0.2734 | 0.3413 | 0.3944 | 0.4332 |

- (b) An urn contains four tickets marked with numbers 112, 121, 211, 222 and one ticket is drawn at random. Let $A_i = (i=1,2,3)$ be the event that i^{th} digit of the number of the ticket drawn is 1. Discuss the independence of the events A_1, A_2 and A_3 . **10**
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