

(Time: 2½ hours)

Total Marks: 75

- N. B.: (1) **All** questions are **compulsory**.  
 (2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.  
 (3) Answers to the **same question** must be **written together**.  
 (4) Numbers to the **right** indicate **marks**.  
 (5) Draw **neat labeled diagrams** wherever **necessary**.  
 (6) Use of **Non-programmable** calculators is **allowed**.

**1. Attempt any three of the following:**

15

- a. Compute the median.

|           |    |    |    |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|----|----|----|
| Size      | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 |
| Frequency | 48 | 52 | 56 | 60 | 63 | 57 | 55 | 50 | 52 |

- b. Define Geometric Mean. How to calculate it?
- 
- Find the G.M. of 250, 12, 4.5, 119.5, 42, 35.4, 75, 30

- c. From the following data, calculate
- $Q_1$
- and
- $Q_3$
- .

|                 |    |    |    |    |    |     |     |
|-----------------|----|----|----|----|----|-----|-----|
| Marks more than | 10 | 20 | 30 | 40 | 50 | 60  | 70  |
| No. of Students | 12 | 30 | 54 | 76 | 91 | 101 | 102 |

- d. Calculate the standard deviation of the heights of 10 students given as,

|                  |     |     |     |     |     |     |     |     |     |     |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Height (in cms.) | 161 | 162 | 160 | 163 | 160 | 163 | 164 | 164 | 170 | 164 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

- e. Find the quartile deviation for the following data.

|                  |   |    |    |    |    |    |
|------------------|---|----|----|----|----|----|
| Marks x          | 5 | 10 | 15 | 20 | 25 | 30 |
| No. of Student f | 2 | 3  | 8  | 7  | 6  | 4  |

- f. Define Factors and Data Frames in 'R'. How to create them in 'R'.

**2. Attempt any three of the following:**

15

- a. Explain the Relation between Raw Moments and Central Moments.

- b. Define Skewness. Compute Coefficient of Skewness for the following observations 2, 3, 5, 7, 4, 8, 1.

- c. A random variable X has the following probability distribution values of X

|             |   |   |    |    |    |       |        |            |
|-------------|---|---|----|----|----|-------|--------|------------|
| <b>X</b>    | 0 | 1 | 2  | 3  | 4  | 5     | 6      | 7          |
| <b>P(X)</b> | 0 | k | 2k | 2k | 3k | $k^2$ | $2k^2$ | $7k^2 + k$ |

Find (i) k (ii)  $P(X < 6)$  (iii)  $P(X \geq 6)$  (iv)  $P(0 < X < 5)$ 

[TURN OVER]

- d. The data from a survey of 140 students showed that 37 study Music, 103 play a sport and 25 do neither. Create a Venn diagram to illustrate the data collected and then determine the probability that if a student is selected at random.
- He or she will study music
  - He or she will study music given that he or she play sport
- e. It has been found that 2% of the tools produced by a certain machine are defective. What is the probability that in a shipment of 400 such tools.
- 3% or more
  - 2% or less
- will prove defective?
- f. The electric light bulbs of manufacturer A have a mean lifetime of 2800 hours with a standard deviation of 400 hours. While those of manufacturer B have a mean lifetime of 2400 hours with standard deviation of 200 hours. If random samples of 250 bulbs of each brand are tested, what is the probability that the brand A bulbs will have a mean lifetime that is at least,
- 320 hours
  - 500 hours more than the brand B bulbs?

**3. Attempt any three of the following:**

**15**

- Five bolts drawn From the bolts produced by a certain machine have lengths 3.3, 3.28, 3.31, 3.33, 3.28 cms. Find an unbiased estimate of the variance of the length the bolts produced by the machine
- A random sample of 100 articles selected from a batch of 2000 articles shows the average diameter of the articles is 0.354 with standard deviation 0.048. find 95% confidence interval for the average whole batch.
- How to calculate an Interval Estimate? State the difference between a Point Estimate and an Interval Estimate.
- For a certain test for coin;  $H_0 : P = \frac{1}{2}$  against  $H_1 : P = \frac{1}{3}$  can be retained where P represents the probability of getting a tail. To decide this coin is tossed four times and  $H_0$  reject only if the number of heads observed is 0 or 1. Find the probability of both types of errors.
- A certain coin is showed up head 270 occasions in 500 tosses. Test the claim that the coin is unbiased.
- Explain with example in-built functions available in 'R' to generate normal distribution.

**[TURN OVER]**

4. Attempt any three of the following:

15

- a. For a random sample of 10 pigs fed on diet A, the increases in weight in pounds in a certain period were:  
10, 6, 16, 17, 13, 12, 8, 14, 15, 9 lbs.  
For another sample of 12 pigs, fed on diet B, the increases in the same period were.  
7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17 lbs  
Test whether diets A and B differ significantly in weight. Take  $\alpha = 0.05$

- b. Test the significance of the following rank correlation coefficient at 5% level.  
 $R = 0.139, n = 10$

- c. Suppose 3 groups each consisting of four students are taken from class XII from 3 different schools. A test of mathematics is taken. The results is:

|            |                |
|------------|----------------|
| School A : | 71, 75, 65, 69 |
| School B : | 90, 80, 86, 84 |
| School C : | 72, 77, 76, 79 |

Compare the mean scores of the schools.

- d. In an experiment to study the independence of hypertension on smoking habits, the following data are taken from 180 individuals.

|                 | Non-smokers | Moderate smokers | Heavy smokers | Total |
|-----------------|-------------|------------------|---------------|-------|
| Hypertension    | 21          | 36               | 30            | 87    |
| No-hypertension | 48          | 26               | 19            | 93    |
| Total           | 69          | 62               | 49            | 180   |

Test the hypothesis at 0.05 level of significance that the presence or absence of hypertension is independent of smoking habits.

- e. The number of defects per unit in a sample of 330 units of a manufactured product was found as follow:

|                |   |    |    |   |   |
|----------------|---|----|----|---|---|
| No. of defects | 0 | 1  | 2  | 3 | 4 |
| No. of units   | 2 | 92 | 20 | 3 | 1 |

Fit a position distribution to the data and test the goodness of fit.

- f. How to calculate Contingency Coefficient?

[TURN OVER]

5. Attempt any three of the following:

15

- a. Find the regression lines of equation for the following.

|                                    |   |    |    |    |    |
|------------------------------------|---|----|----|----|----|
| Advertising Expenditure ('000 Rs.) | 3 | 5  | 7  | 9  | 11 |
| Quarterly Sales ('0000 units)      | 9 | 12 | 16 | 14 | 15 |

- b. Fit a second degree curve
- $Y = a+bx+cx^2$
- to the following data

|   |    |    |    |    |    |    |
|---|----|----|----|----|----|----|
| x | 5  | 10 | 15 | 20 | 25 | 30 |
| y | 11 | 13 | 16 | 20 | 28 | 36 |

- c. Calculate the Coefficient of Correlation between the Age and Blood pressure of given people from a colony.

|                |     |     |     |     |     |     |     |
|----------------|-----|-----|-----|-----|-----|-----|-----|
| Age in Years   | 60  | 65  | 70  | 40  | 45  | 50  | 55  |
| Blood Pressure | 145 | 160 | 160 | 125 | 140 | 140 | 145 |

- d. Given the following data estimate the linear trend equation. Find trend values and calculate the trend value of

|                           |      |      |      |      |      |
|---------------------------|------|------|------|------|------|
| Year                      | 2010 | 2011 | 2012 | 2013 | 2014 |
| No. of cars (in Thousand) | 11   | 30   | 38   | 50   | 56   |

- e. Find (a)
- $\sigma_x$
- (b)
- $\sigma_y$
- (c)
- $V(x)$
- (d)
- $V(y)$
- and (e)
- $cov(x, y)$
- for the following data:

|   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| x | 1 | 2 | 3 | 5 | 4 | 3 |
| y | 2 | 4 | 5 | 5 | 3 | 1 |

Also verify  $r = \frac{cov(x, y)}{\sigma_x \cdot \sigma_y}$ 

- f. The two regression lines between x and y are given below. Find
- $\bar{x}$
- ,
- $\bar{y}$
- and r.

$$100y - 45x - 1400 = 0$$

$$4y - 5x + 200 = 0$$