(3 Hours) **Total Marks 80**

NB

1) Question **number 1** is compulsory
2) Attempt **any three** out of the remaining **five questions**.
3) Assume suitable data if **necessary** and justify the assumptions.
4) Figures to the **right** indicate full marks

Q1 Answer the following 20

a) Define Statistics and list the limitations of statistics.
b) Explain sampling and purpose of sampling.
c) What is regression analysis? How does it differ from correlation
d) Show that sample variance (S^2) is an unbiased estimator of population variance (σ^2). Also illustrate with an example.

Q2 a) In a laboratory experiment on correlation research study, the equations to the two regression lines were found to be 2x-y + 1 = 0 and 3x-2y+7 = 0. Find the mean of x and y. Also work out the values of regression coefficients and correlation coefficient between the two variables x and y. 10

b) The frequency distribution of scores obtained by 250 candidates in an entrance tests is as follows. Draw a less than and more than frequency curve (ogive) to represent the given data. Also what is the significance of the point of intersection of the two ogive curves? 10

Scores	Number of candidates
400 – 450	25
450 – 500	30
500 – 550	45
550 – 600	37
600 – 650	30
650 – 700	33
700 – 750	15
750 – 800	35

Q3 a) The following table gives the age of cars of a certain make and annual maintenance costs. Obtain the regression equation for Maintenance costs, taking age of the car as the independent variable. Also find the maintenance cost for Age of the car = 5 years 10

Age of cars (in Years)	Maintenance cost (In thousands of rupees)
2	10
4	20
6	25
8	30

b) Explain with illustration the concept of Point estimation 10

Q4 a) Following is the data about the weights in Kgs of 10 Shipments (X_1), the distances they were moved (X_2) and the damage that was incurred (Y). 10

i) Fit a regression $\hat{Y} = a + b_1X_1 + b_2X_2$

ii) Find the coefficient of multiple determination (R^2).

iii) Also test the significance of regression (Given the appropriate Table value, F = 9.55, for a significance level of α = 0.01)

Shipment	Damage (thousands of Rs) (Y)	weights in Kgs (X_1)	Distance moved in Km (X_2)
1	12	17	10
2	15	15	6
3	14	15	10
4	19	10	21
5	8	13	8
6	16	15	13
7	15	11	9
8	25	6	25
9	10	15	10
10	11	7	8

b) Explain primary data and secondary data in detail 10

Q5 a) Given $r_{12} = 0.7$, $r_{13} = 0.61$ and $r_{23} = 0.4$. Compute i) $r_{23.1}$, ii) $r_{13.2}$, iii) $r_{12.3}$ 10

b) Differentiate between the following pair of concepts: 10

i) Critical Region and Region of acceptance.

ii) Null Hypothesis and Alternative Hypothesis

Q6 Write short note on 20

a) Pie chart and its advantages and disadvantages

b) Method of moments

c) Multiple Regression

d) Neyman Pearson Lemma