Time: 1 Hr.

Marks:30

Note: (1) All questions are compulsory with internal choice.
(2) Figures to the right indicate full marks.
(3) Symbols have their usual meanings.
(4) Scientific calculator fx 82 series or lower version is only permitted.
(5) Graph paper will be provided on request.

Q.1 Attempt <u>Any Two</u> of the following. **(15)**

(1) A company analyzed the weekly working hours of 50 employees. The data is:

Weekly Working Hours	30-34	35-39	40-44	45-49	50-54	55-59
Number of Employees	3	7	15	12	8	5

(i) Develop a cumulative frequency table and draw an ogive.
(ii) Using the ogive, estimate the median working hours.
(iii) Based on the median, discuss whether the majority of employees work close to the standard 40-hour workweek.

(2) A teacher analyzed the performance of 60 students.

Exam Score Range	20-29	30-39	40-49	50-59	60-69	70-79
Number of Students	6	10	14	18	8	4

(i) Compute the mean and standard deviation of scores.
(ii) Calculate the coefficient of variation.
(iii) Discuss whether student performance is consistent or highly variable.

(3) An investor is analyzing stock market returns over time:

Daily Return (%)	-4 to -2	-1 to 1	2 to 4	5 to 7	8 to 10
Number of Trading Days	6	10	15	12	7

(i) Compute the first four raw moments.
(ii) Determine skewness and kurtosis of returns.
(iii) If skewness is negative, what does it imply about investment risk?

(4) Define statistics as a science and explain its significance in decision-making.

Q.2 Attempt <u>Any Two</u> of the following. **(15)**

(1) A researcher analyzes how the number of hours spent training an AI model affects its accuracy (% correct predictions):

Training Hours (X)	1	3	5	7	9	12
Accuracy (%) (Y)	60	70	75	80	85	90

(i) Compute the Spearman Rank Correlation Coefficient to check if more training improves accuracy.
(ii) Is the relationship linear? Explain with reasoning.
(iii) If a model reaches 95% accuracy at 15 hours, does this justify more training beyond 12 hours? Why or why not?

(2) A content creator analyzes how video length (minutes)impactsaverage watch time (minutes):

Video Length (X)	3	6	9	12	15
Watch Time (Y)	2.5	4.8	6.7	7.8	8.2

   (i) Fit a least-squares regression line.
   (ii) Predict watch time for a 20-minute video.
   (iii) Should longer videos be recommended? Explain.

(3) A hospital is analyzing how daily exercise (X_1, in minutes) and caloric intake (X_2, in kcal) influence a patient's blood sugar level (Y, in mg/dL). The data for five patients is provided below:

Patient	A	B	C	D	E
Exercise (X_1)	30	45	60	75	90
Caloric Intake (X_2)	2000	2200	2500	2800	3000
Blood Sugar (Y)	140	135	130	125	120

The following correlation coefficients are given:
- $r_{X_1Y} = -0.97$ (Exercise vs. Blood Sugar)
- $r_{X_2Y} = -0.92$ (Caloric Intake vs. Blood Sugar)
- $r_{X_1X_2} = -0.89$ (Exercise vs. Caloric Intake)

   (i) Compute the Multiple Correlation Coefficient$R_{Y. X_1X_2}$
   (ii) Which factor (exercise or caloric intake) has a stronger individualimpact on blood sugar levels?
   (iii) Does the combined influence of exercise and caloric intake improve the prediction of blood sugar levels compared to individual correlations?
   (iv) If a diabetic patient can only change one factor, which should they prioritize based on correlation values?
   (v) The value of $R_{Y. X_1X_2}$ represents how well blood sugar levels can be predicted using both exercise and caloric intake. Is it close to 1 (strong prediction) or lower (weak prediction)?

(4) Explain the different types of correlationwith suitable real-life examples. How can ascatter diagramhelp in visually identifying the nature of correlation between two variables?

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