

(3 Hours)

(Total Marks: 80)

- N.B.:** 1. Question No. 1 is compulsory.
 2. Answer any three out of the remaining questions.
 3. Assume suitable data if necessary.
 4. Figures to the right indicate full marks.

Q1. Attempt the following (any 4): (20)

- a. Compare descriptive and inferential statistics.
 b. A bag contains four balls. Two balls are drawn at random (without replacement) and are found to be white. What is the probability that all balls in the bag are white?
 c. Calculate the coefficient of correlation (r) for the following data:

x	9	8	7	6	5	4	3	2	1
y	15	16	14	13	11	12	10	8	9

- d. What are type I and type II errors?
 e. Construct 3 yearly moving averages from the following data:

Year	2017	2018	2019	2020	2021	2022	2023
Annual sale (in lakhs)	39	44	40	45	38	43	39

Q2. Attempt the following:

- a. The Dow Jones Travel Index reported what business travelers pay for hotel rooms per night in major U.S. cities (The Wall Street Journal, January 16, 2004). The average hotel room rates for 20 cities are as follows: (10)

Atlanta	\$163	Minneapolis	\$125
Boston	177	New Orleans	167
Chicago	166	New York	245
Cleveland	126	Orlando	146
Dallas	123	Phoenix	139
Denver	120	Pittsburgh	134
Detroit	144	San Francisco	167
Houston	173	Seattle	162
Los Angeles	160	St. Louis	145
Miami	192	Washington, D.C.	207

- (a) Calculate the mean hotel room rate (b) Calculate the median hotel room rate
 (c) Calculate the mode (d) Calculate the first quartile
 (e) Calculate the third quartile
- b. Explain Poisson probability distribution. A car distributor in a city Y experiences on an average 2.5 car sales per day. Find the probability that on a randomly selected day, (10)
 (a) they will sell 5 cars (b) they will sell no cars (c) they will sell at most 2 cars

Q3. Attempt the following:

- a. What is sampling? State and explain different sampling methods. (10)
 b. A random sample of size 64 is taken from a normal population with $\mu = 51.4$ and $\sigma = 6.8$. What is the probability that the mean of the sample will (10)
 (a) exceed 52.9 (b) fall between 50.5 and 52.3 (c) be less than 50.6

Q4. Attempt the following:

a. A company manufacturing automobile tyres finds that tyre life is normally distributed with a mean of 40,000 km and standard deviation of 3,000 km. It is believed that a change in the production process will result in a better product and the company has developed a new tyre. A sample of 100 new tyres has been selected. The company has found that the mean life of these tyres is 40,900 km. Can it be concluded that the new tyre is significantly better than the old one? Use 1% LOS. (10)

b. The population proportion (p) is 0.30. What is the probability that a sample proportion will be within ± 0.04 of the population proportion for each of the following sample sizes:

- (a) $n = 100$ (b) $n = 200$
 (c) $n = 500$ (d) $n = 1000$
 (e) What is the advantage of a larger sample size? (10)

Q5. Attempt the following:

a. The following data gives the experience of machine operators and their performance rating as given by the number of good parts turned out per 100 pieces. (10)

Operators	1	2	3	4	5	6
Performance rating (x)	23	43	53	63	73	83
Experience (y)	5	6	7	8	9	10

Calculate the regression line of performance rating (x) on experience (y) and also estimate the probable performance if an operator has 11 years of experience.

b. Consider a sample with a mean of 30 and a standard deviation of 5. Use Chebyshev's theorem to determine the percentage of the data within each of the following ranges. (10)

- (a) 20 to 40 (b) 15 to 45 (c) 22 to 38 (d) 18 to 42 (e) 12 to 48

Q6. Attempt the following:

a. From the following data, obtain two regression equations and estimate the value of sales when purchases were 75. Also, estimate the value of purchases when sales were 100. (10)

Sales	91	97	108	121	67	124	51	73	111	57
Purchases	71	75	69	97	70	91	39	61	80	47

b. What are non-parametric tests? Calculate Spearman's rank correlation coefficient between expenditure on advertising and sales from the data given below: (10)

Advertising expenses ('000 Rs.)	39	65	62	90	82	75	25	98	36	78
Sales (lakh Rs.)	47	53	58	86	62	68	60	91	51	84
