Enrolment No. /Seat No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA – SEMESTER IV- EXAMINATION –WINTER-2024

Subject Code: 4649302 **Date: 27/11/2024**

Subject Name: Statistical Methods

Time:02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make Suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of simple calculators and non-programmable scientific calculators are permitted.**

Q.1 **(a)** **Answer following:** **04**

1. Define frequency polygon.
2. Define kurtosis.
3. Describe skewness.
4. State the Chebyshev's theorem.

(b) Explain data measurement levels. **03**

(c) For a given frequency distribution, determine class midpoint, the relative frequency and the cumulative frequency. **07**

Class Interval	Frequency
1–3	4
3–5	12
5-7	13
7–9	19
9–11	7
11–13	5

Q.2 **(a)** Compute the 35th percentile, the 55th percentile, Q_1, Q_2, and Q_3 for the following data. **05**

16 28 29 13 17 20 11 34 32 27 25 30 19 18 33

(b) Explain mutually exclusive events. **02**

(c) Calculate mean and mode of the following data: **07**

Class Interval	Frequency
0-2	39
2-4	27
4-6	16
6-8	15
8-10	10
10-12	8
12-14	6

OR

(c) According to a report, the average monthly household cellular phone bill is \$60. Suppose local monthly household cell phone bills are normally distributed with a standard deviation of \$11.35. **07**

a. What is the probability that a randomly selected monthly cell phone bill is more

than $85?

b. What is the probability that a randomly selected monthly cell phone bill is between $45 and $70?

c. What is the probability that a randomly selected monthly cell phone bill is between $65 and $75?

Q.3 **(a)** Explain simple random sampling and stratified random sampling techniques in detail. **07**

(b) Use the following data to construct 99% confidence interval. x is normally distributed. **07**

16.4	17.1	17	15.6	16.2
14.8	16	15.6	17.3	17.4
15.6	15.7	17.2	16.6	16
15.3	15.4	16	15.8	17.2
14.6	15.5	14.9	16.7	16.3

OR

Q.3 **(a)** What is uniform distribution? Explain probability density function of uniform distribution with its mean and standard deviation. **07**

(b) According to Research, the average number of hours of TV viewing per household per week in the United States is 50.4 hours. Suppose the standard deviation is 11.8 hours and a random sample of 42 U.S. households is taken. **07**

a. What is the probability that the sample average is more than 52 hours?

b. What is the probability that the sample average is less than 47.5 hours?

c. What is the probability that the sample average is less than 40 hours?

Q.4 **(a)** According to the report, the average weekly earnings of a production worker in 1997 were $424.20. Suppose a labor researcher wants to test to determine whether this figure is still accurate today. The researcher randomly selects 54 production workers and obtains a representative earnings statement for one week from each. The resulting sample average is $432.69. Assuming a population standard deviation of $33.90, and a 5% level of significance, determine whether the mean weekly earnings of a production worker have changed. **07**

(b) Determine the equation of regression line. **07**

x	y
99.9	2.74
97.9	2.87
98.9	2.93
87.9	2.87
92.9	2.98
97.9	3.09
100.6	3.36
104.9	3.61
105.3	3.75
108.6	3.95

OR

Q.4 **(a)** Regression Model for the following data is $\hat{y} = -46.292 + 15.240\ x$. **07**

x	y
12.5	148
3.7	55
21.6	338
60	994
37.6	541
6.1	89

16.8	126
41.2	379

Compute sum of squares of error and standard error of estimate for above data.

(b) A large manufacturing company investigated the service it received from suppliers and discovered that, in the past, 32% of all materials shipments were received late. However, the company recently installed a just-in-time system in which suppliers are linked more closely to the manufacturing process. A random sample of 118 deliveries since the just-in-time system was installed reveals that 22 deliveries were late. Use this sample information to test whether the proportion of late deliveries was reduced significantly. Let $\alpha = .05$. **07**

Q.5 **(a)** Explain type-I and type-II errors in detail. **07**

(b) Solve the following by using the values given in cross-tabulation table. **07**

a) P(C | A)

b) P(B | D)

c) P(A | B)

	C	D
A	0.36	0.44
B	0.11	0.09

OR

Q.5 **(a)** Determine coefficient of correlation r for the data. **07**

x	y
0.46	0.48
0.52	0.62
0.9	0.72
1.5	1.74
2.89	2.03
1.8	1.92
3.29	3.18
5.73	4.43

(b) The following data (in pounds), which were selected randomly from a normally distributed population of values, represent measurements of a machine part that is supposed to weigh, on average, 8.3 pounds. **07**

8.1 8.4 8.3 8.2 8.5 8.6 8.4 8.3 8.4 8.2

8.8 8.2 8.2 8.3 8.1 8.3 8.4 8.5 8.5 8.7

Use these data and $\alpha = .10$ to test the hypothesis that the parts average 8.3 pounds.

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