Enrolment No. /Seat No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA INTEGRATED – SEMESTER III- EXAMINATION –WINTER-2025

Subject Code: 2638602 **Date: 01/12/2025**

Subject Name: Basic Statistics

Time:10:30 AM TO 01:00 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)** Explain the following terms **07**

1. Degree of freedom
2. Standard error
3. Mutually exclusive events
4. Conditional probability
5. Skewness
6. Empirical rule
7. kurtosis

(b) A data set contains the following seven values. **07**

6, 2, 4, 9, 1, 3, 5.

a. Find mean
b. Find median
c. Find the range.
d. Find the mean absolute deviation.
e. Find the population variance.
f. Find the population standard deviation.
g. Find the interquartile range.

Q.2 **(a)** Use the values in the matrix to solve the equations given. **07**

	E	F
A	0.10	0.03
B	0.04	0.12
C	0.27	0.06
D	0.31	0.07

Find

a) P(A∪F)
b) P(E∪B)
c) P(B∪C)
d) P(E∪F)
e) P(A∪B)
f) P(E∪A)
g) P(B∪F)

(b) Construct Box Plot for the data. **07**

71	87	82	64	72	75	81	69
76	79	65	68	80	73	85	71
70	79	63	62	81	84	77	73
82	74	74	73	84	72	81	65
74	62	64	68	73	82	69	71

OR

(b) In a manufacturing plant, machine A produces 10% of a certain product, machine B produces 40% of this product, and machine C produces 50% of this product. Five percent of machine A products are defective, 12% of machine B products are defective, and 8% of machine C products are defective. The company inspector has just sampled a product from this plant and has found it to be defective. Determine the revised probabilities that the sampled product was produced by machine A, machine B, or machine C. **07**

Q.3 **(a)** The Wall Street Journal reported some interesting statistics on the job market. One statistic is that 40% of all workers say they would change jobs for "slightly higher pay." In addition, 88% of companies say that there is a shortage of qualified job candidates. Suppose 16 workers are randomly selected and asked if they would change jobs for "slightly higher pay." **07**

a) What is the probability that nine or more say yes?
b) What is the probability that three, four, five, or six say yes?
c) If 13 companies are contacted, what is the probability that exactly 10 say there is a shortage of qualified job candidates?
d) If 13 companies are contacted, what is the probability that all of the companies say there is a shortage of qualified job candidates?

(b) A pen company averages 1.2 defective pen per carton produced (200 pens). The number of defects per carton is Poisson distributed. **07**

a) What is the probability of selecting a carton and finding no defective pens?
b) What is the probability of finding eight or more defective pens in a carton?
c) Suppose a purchaser of these pens will quit buying from the company if a carton contains more than three defective pens. What is the probability that a carton contains more than three defective pens?

OR

Q.3 **(a)** Toolworkers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome. It strikes as many as 23,000 workers per year. The U.S. Labor Department estimates that the average cost of this disorder to employers and insurers is approximately $30,000 per injured worker. Suppose these costs are normally distributed, with a standard deviation of $9,000. **07**

a) What proportion of the costs is between $15,000 and $45,000?
b) What proportion of the costs is greater than $50,000?
c) What proportion of the costs is between $5,000 and $20,000?

(b) Explain Probability Distributions in detail. **07**

Q.4 **(a)** Explain Type-I and Type – II Errors in detail. **07**

(b) The Independent Insurance Agents of America conducted a survey of insurance consumers and discovered that 48% of them always reread their insurance policies, 29% sometimes do, 16% rarely do, and 7% never do. Suppose a large insurance company invests considerable time and money in rewriting policies so that they will be more attractive and easy to read and understand. After using the new policies for a year, company managers want to determine whether rewriting the policies significantly changed the proportion of policyholders who always reread their insurance policy. They contact 380 of the company's insurance consumers who purchased a policy in the past year and ask them whether they always reread their insurance policies. 164 respond that they do. Use a 1% level of significance to test the hypothesis. **07**

OR

Q.4 **(a)** Explain different types of Sampling methods. **07**

(b) According to the U.S. Bureau of Labor Statistics, 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 from across the United States 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**

Q.5 **(a)** Suppose a random sample of 85 items has been taken from a population and 40 of the items contain the characteristic of interest. Use this information to calculate a 90% confidence interval to estimate the proportion of the population that has the characteristic of interest. Calculate a 95% confidence interval. Calculate a 99% confidence interval. As the level of confidence changes and the other sample information stays constant, what happens to the confidence interval? **07**

(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 $\alpha = 0.01$ to test the hypothesis that the parts average 8.3 pounds.

OR

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

x	9	9	12	13	15	16	18	19	20	25
y	22	20	18	17	16	15	15	13	12	11

(b) Determine the equation of the regression line for the following data, and compute the residuals. **07**

X	15	8	19	12	5
Y	47	36	56	44	21

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