Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA– SEMESTER IV- EXAMINATION –WINTER-2023

Subject Code:4649302 Date: 22/12/2023

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)** Define following Terms: **07**

i.	Histogram	ii.	Cumulative Frequency
iii.	Sample Space	iv.	IQR
v.	Mutually Exclusive Events	vi.	Exhaustive Events
vii.	Coefficient of variation		

(b) Provide significance of following terms in Descriptive Statistics : **07**

i.	Mean	ii.	Median
iii.	Mode	iv.	Skewness
v.	Kurtosis	vi.	Standard Deviation
vii.	Z Score		

Q.2 **(a)** Differentiate: Descriptive Statistics vs Inferential Statistics. **03**

(b) Compare Various Levels of Data with suitable examples. **04**

(c) Compute P_{20}, P_{47}, P_{83}, Q_1, Q_2, and Q_3 for the following data. **07**

120 138 97 118 172 144 138 107 94 119 139 145

162 127 112 150 143 80 105 116 142 128 116 171

OR

(c) A company produces a mechanical valves with their weight is normally distributed with a mean weight of 1365 grams and a standard deviation of 294 grams. Answer the following questions: **07**

(i)Within what range of weights would approximately 95% of the valve weights fall?

(ii)Around 16% of the weights would be more than what value?

(iii)Around 0.15% of the weights would be less than what value?

Q.3 **(a)** Construct a stem-and-leaf plot using two digits for the stem. **03**

212 239 240 218 222 249 265 224 257 271

266 234 239 219 255 260 243 261 249 230

246 263 235 229 218 238 254 249 250 263

229 221 253 227 270 257 261 238 240 239

273 220 226 239 258 259 230 262 255 226

(b) Explain usage of standard deviation using Chebyshev's Theorem. **04**

(c) Suppose the test for COVID19 is 99% accurate in both directions and 0.3% of the population is COVID19 positive. If someone tests positive, what is the probability they actually are COVID19 positive? **07**

OR

Q.3 **(a)** Compare and Contrast : Population Parameters and Sample Statistics **03**

(b) If X and Y are independent events, the P(X|Y) = P(X) and P(Y|X) = P(Y). Justify correctness of statement using suitable example data. **04**

(c) A survey of 200 executives who were asked to identify the Location and Type of Industry for their business. The executives were only allowed to select one locale and one industry type. Answer following questions following data : **07**

	City X	City Y	City Z	City W	
CAT A	24	10	8	14	56
CAT B	30	6	22	12	70
CAT C	28	18	12	16	74
	82	34	42	42	200

i. What is the probability that the respondent has selected City Z?

ii. What is the probability that the respondent has selected Category C Industry or selected City X?

iii. What is the probability that the respondent has selected City Y or has selected Category A industry?

iv. Respondent has selected City Y and selected Category B Industry

v. Respondent has selected City W and selected Category A Industry

vi. Respondent has selected Category B and Category C Industry

vii. Respondent has selected City Z after selecting Category B Industry.

Q.4 **(a)** Explain Bayes' Theorem with specific conditions. **03**

(b) In a Town, 51% of the adults are males. In a survey it is found that 9.5% of males smoking habit while 1.7% of females having smoking habits .One adult is randomly selected for a survey involving credit card usage. **04**

i. Find the prior probability that the selected person is a male

ii. Find the probability that the selected subject is a male having smoking habit.

(c) A factory production line is manufacturing bolts using three machines, A, B and C. Of the total output, machine A is responsible for 25%, machine B for 35% and machine C for the rest. It is known from previous experience with the machines that 5% of the output from machine A is defective, 4% from machine B and 2% from **07**

machine C. A bolt is chosen at random from the production line and found to be defective. What is the probability that it came from (a) machine A (b) machine B (c) machine C?

OR

Q.4 **(a)** Write characteristics of Normal Distribution. **03**

(b) Explain Poisson Process. **04**

(c) A manufacturer produces light-bulbs that are packed into boxes of 100. If quality control studies indicate that 0.5% of the light-bulbs produced are defective, what percentage of the boxes will contain: (a) no defective? (b) 2 or more defectives? **07**

Q.5 **(a)** Define One-tail and two-tail test. **03**

(b) Explain Type I and Type II Error with examples. **04**

(c) Explain the different sampling methods. **07**

OR

Q.5 **(a)** What is correlation? What are applications of finding correlation? What is regression analysis? **03**

(b) Determine the value of *r* for the following data. **04**

X: 158 296 87 110 436

Y: 349 510 301 322 550

(c) Develop the equation of the simple regression line to predict sales from advertising expenditures using given data: **07**

Advertising	**Sales**
12.5	148
3.7	55
21.6	338
60	994
37.6	541
6.1	89
16.8	126
41.2	379

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