Enrolment No. /Seat No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA– SEMESTER II- EXAMINATION –SUMMER-2024

Subject Code: 629409 **Date: 11/06/2024**

Subject Name: Statistical Methods

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) Fill in the blanks. 07

1. Two events are_____ if they have no events in common, if one has occurred the other cannot. When this is true P(A and B) =_____. (exhaustive, exclusive; 0, 1)
2. The mean plus and minus 2 standard deviation includes _____ percentage of the items in normal distribution. (68, 95, 99.7)
3. The order of arrangement is important in_____. (combination, permutation)
4. The Sum of deviations taken from mean is_____. (zero, maximum, minimum)
5. O-give for more than type and less than type distribution intersects at _____. (mean, median, mode)
6. Mean and variance of _____ variate is same. (Binomial, Poisson, Normal)
7. The middle 50% data lie in the _____ range. (inter-quartile, inter-decile, inter-percentile)

(b) Calculate mean and standard deviation for the data. 07

Age Group	Frequency
18–24	17
24–30	22
30–36	26
36–42	35
42–48	33
48–54	30
54–60	32
60–66	21
66–72	15

Q.2 (a) Explain data measurement scale. 07

(b) According to the Consumer Electronics Manufacturers Association, 10% of all U.S. households have a fax machine and 52% have a personal computer. Suppose 91% of all U.S. households having a fax machine have a personal computer. A U.S. household is randomly selected. 07

a. What is the probability that the household has a fax machine and a personal computer?
b. What is the probability that the household has a fax machine or a personal computer?

c. What is the probability that the household has a fax machine and does not have a personal computer?
d. What is the probability that the household has neither a fax machine nor a personal computer?
e. What is the probability that the household does not have a fax machine and does have a personal computer?

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) Tompkins Associates reports that the mean clear height for a Class A warehouse in the United States is 22 feet. Suppose clear heights are normally distributed and that the standard deviation is 4 feet. A Class A warehouse in the United States is randomly selected. 07
a. What is the probability that the clear height is greater than 17 feet?
b. What is the probability that the clear height is less than 13 feet?
c. What is the probability that the clear height is between 25 and 31 feet?

(b) A data firm records a large amount of data. Historically, 0.9% of the pages of data recorded by the firm contain errors. If 200 pages of data are randomly selected, 07
a. What is the probability that six or more pages contain errors?
b. What is the probability that more than 10 pages contain errors?
c. What is the probability that none of the pages contain errors?
d. What is the probability that fewer than five pages contain errors?

OR

Q.3 (a) Write detail note on binomial distribution and Solve the following problems by using the binomial formula. 07
a. If $n = 4$ and $p = 0.10$, find $P(x = 3)$.
b. If $n = 7$ and $p = 0.80$, find $P(x = 4)$.
c. If $n = 10$ and $p = 0.60$, find $P(x \geq 7)$.
d. If $n = 12$ and $p = 0.45$, find $P(5 \leq x \leq 7)$.

(b) Explain probability distribution 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) Suppose the following data are selected randomly from a population of normally distributed values. 07

40, 51, 43, 48, 44, 57, 54, 39, 42, 48, 45, 39, 43

Construct a 95% confidence interval to estimate the population mean.

Q.5 (a) What is Hypothesis? Give the detail note on general process of testing of hypothesis. 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

OR

Q.5 (a) Explain Regression analysis and define the following terms with necessary formula 07

1. Residual
2. Standard Error of the Estimate
3. Coefficient of Determination

(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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