GUJARAT TECHNOLOGICAL UNIVERSITY
MCA - SEMESTER– IV• EXAMINATION – WINTER 2020

Subject Code:4649302   **Date:02/01/2021**

Subject Name:Statistical Methods

Time:02:00 PM to 04:00 PM   **Total Marks: 56**

Instructions:
1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define: Statistics. Explain in detail different scales of measurement.	**07**
Q.1	**(b)**	For each class interval of the frequency distribution given, determine the class midpoint, the relative frequency and the cumulative frequency:	**07**

Class	Frequency
0-under 5	6
5-under 10	8
10-under 15	17
15-under 20	23
20-under 25	18
25-under 30	10
30-under 35	4
Totals	86

Q.2	**(a)**	Find the value of the Coefficient of Correlation (r) for the following data:	**07**

X	158	296	87	110	436
Y	349	510	301	322	550

Q.2	**(b)**	The U.S. Energy Department states that 60% of all U.S. households have ceiling fans. In addition, 29% of all U.S. households have an outdoor grill. Suppose 13% of all U.S. households have both a ceiling fan and an outdoor grill. A U.S. household is randomly selected.	**07**

a. What is the probability that the household has a ceiling fan or an outdoor grill?

b. What is the probability that the household has neither a ceiling fan nor an outdoor grill?

c. What is the probability that the household does not have a ceiling fan and does have an outdoor grill?

d. What is the probability that the household does have a ceiling fan and does not have an outdoor grill?

Q.3 **(a)** An increasing number of consumers believe they have to look out for themselves in the marketplace. According to a survey conducted by the Yankelovich Partners for USA WEEKEND magazine, 60% of all consumers have called an 800 or 900 telephone number for information about some product. Suppose a random sample of 25 consumers is contacted and interviewed about their buying habits. **07**

a. What is the probability that 15 or more of these consumers have called an 800 or 900 telephone number for information about some product?

b. What is the probability that more than 20 of these consumers have called an 800 or 900 telephone number for information about some product?

c. What is the probability that fewer than 10 of these consumers have called an 800 or 900 telephone number for information about some product?

Q.3 **(b)** In a recent year, the average price of a Microsoft Windows Upgrade was $90.28 according to PC Data. Assume that prices of the Microsoft Windows Upgrade that year were Normally Distributed, with a standard deviation of $8.53. If a retailer of computer software was randomly selected that year: **07**

a. What is the probability that the price of a Microsoft Windows Upgrade was below $80?

b. What is the probability that the price was above $95?

c. What is the probability that the price was between $83 and $87?

Q.4 **(a)** A pen company averages 1.2 defective pens 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?

Q.4 **(b)** The average length of time between arrivals at a turnpike tollbooth is 23 seconds. Assume that the time between arrivals at the tollbooth is Exponentially Distributed. **07**

a. What is the probability that a minute or more will elapse between arrivals?

b. If a car has just passed through the tollbooth, what is the probability that no car will show up for at least 3 minutes?

Q.5 **(a)** A population is normally distributed, with a mean of 23.45 and a standard deviation of 3.8. What is the probability of each of the following? **07**

a. Taking a sample of size 10 and obtaining a sample mean of 22 or more?

b. Taking a sample of size 4 and getting a sample mean of more than 26?

Q.5 **(b)(i)** For a random sample of 36 items and a sample mean of 211, compute a 95% confidence interval for μ if the population standard deviation is 23. **04**

Q.5 **(b)(ii)** A national beauty salon chain wants to estimate the number of times per year a woman has her hair done at a beauty salon if she uses one at least once a year. The chain's researcher estimates that, of those women who use a beauty salon at least once a year, the standard deviation of number of times of usage is approximately 6. The national chain wants the estimate to be within one time of the actual mean value. How large a sample should the researcher take to obtain a 98% confidence level? **03**

Q.6 **(a)** According to a survey by Accountemps, 48% of executives believe that employees are most productive on Tuesdays. Suppose 200 executives are randomly surveyed.
a. What is the probability that fewer than 90 of the executives believe employees are most productive on Tuesdays?
b. What is the probability that more than 100 of the executives believe employees are most productive on Tuesdays?
c. What is the probability that more than 80 of the executives believe employees are most productive on Tuesdays? **07**

Q.6 **(b)(i)** A national survey of insurance offices was taken, resulting in a random sample of 245 companies. Of these 245 companies, 189 responded that they were going to purchase new software for their offices in the next year. Construct a 90% confidence interval to estimate the population proportion of insurance offices that intend to purchase new software during the next year. **04**

Q.6 **(b)(ii)** A research firm has been asked to determine the proportion of all restaurants in the state of Ohio that serve alcoholic beverages. The firm wants to be 98% confident of its results but has no idea of what the actual proportion is. The firm would like to report an error of no more than 0.05. How large a sample should it take? **03**

Q.7 **(a)(i)** Use the data given to test the following hypotheses. Assume the data are normally distributed in the population. **04**
$$H_0: \mu = 1200, H_a: \mu \geq 1200$$
$$\overline{x} = 1215, n = 113, \sigma = 100, \alpha = 0.10$$

Q.7 **(a)(ii)** A random sample of 51 items is taken, with $\overline{x} = 58.42$ and $s^2 = 25.68$ and Use these data to test the following hypotheses, assuming you want to take only a 1% risk of committing a Type I error and that x is normally distributed. **03**

Q.7 **(b)** Sketch a scatter plot from the following data and determine the equation of the regression line: **07**

x:	12	21	28	8	20
y:	17	15	22	19	24

Q.8 **(a)(i)** Use the data given to test the following hypotheses. Assume the data are normally distributed in the population. **04**
$$H_0: \mu = 7.48, H_a: \mu < 7.48$$
$$\overline{x} = 6.91, n = 24, \sigma = 1.21, \alpha = 0.01$$

Q.8 **(a)(ii)** A random sample of size 20 is taken, resulting in a sample mean of 16.45 and a sample standard deviation of 3.59. Assume x is normally distributed and use this information and $\alpha = 0.05$ to test the following hypotheses. **03**
$$H_0: \mu = 16, H_a: \mu \neq 16$$

Q.8 **(b)** Determine the equation of the least squares regression line to predict y from the following data and Determine the Coefficient of Determination (r^2). **07**

x:	213	196	184	202	221	247
y:	76	65	62	68	71	75

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