

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA - SEMESTER-III • EXAMINATION – WINTER - 2013

Subject Code: 2630003**Date: 10-12-2013****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.

- Q.1**
- (a) Define Statistics and Differentiate Quantitative and Qualitative Data **03**
- (b) In an effort to estimate the mean amount spent per customer for dinner at a major Atlanta restaurant, data were collected for a sample of 49 customers. Assume a population standard deviation of \$5. **04**
- a. At 95% confidence, what is the margin of error?
- b. If the sample mean is \$24.80, what is the 95% confidence interval for the population mean?
- (c) For a random sample of 10 persons, fed on diet A, the increased weight in pounds in a certain period were: **07**
- 10, 6, 16, 17, 13, 12, 8, 14, 15, 9
- For another random sample of 12 persons, fed on diet B, the increase in the same period were
- 7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17
- Test whether the diets A and B differ significantly as regards their effect on increase in weight at 5% level of significance.
- Q.2**
- (a) According to the Sleep Foundation, the average night's sleep is 6.8 hours (Fortune, March 20, 2006). Assume the standard deviation is 0.6 hours and that the probability distribution is normal. **07**
- a. What is the probability that a randomly selected person sleeps more than 8 hours?
- b. What is the probability that a randomly selected person sleeps 6 hours or less?
- c. Doctors suggest getting between 7 and 9 hours of sleep each night. What percentage of the population gets this much sleep?
- (b) Consider a sample with data values 27, 25, 20, 15, 30, 34, 28 and 25. Compute Mean and Standard Deviation **04**
- (c) The results of a national survey showed that on average, adults sleep 6.9 hours per night. Suppose that the standard deviation is 1.2 hours. Use Chebyshev's theorem to calculate the percentage of individuals who sleep between 4.5 and 9.3 hours. **03**

OR

- (b) Consider a sample with data values of 27, 25, 20, 15, 30, 34, 28 and 25. **04**
- (i) Provide the five number summaries for the data.
- (ii) Show the Box Plot for the data.
- (c) A department of transportation's study on driving speed and mileage for midsize automobiles resulted in the following data. **03**

Driving Speed	30	50	40	55	30	25	60	25	50	55
Mileage	28	25	25	23	30	32	21	35	26	25

Compute and interpret the sample correlation coefficient.

- Q.3 (a)** Define (i) Mutually Exclusive Events (ii) Exhaustive Events (iii) Equally Likely Events. **03**
- (b)** The probability that a person has a mobile phone is 0.60, the probability that a person has a credit-card is 0.50 and the probability that a person has mobile phone and a credit card is 0.20. Find the probability that (1) The person has mobile phone but not credit card. (2) The person has at least one of them. **04**
- (c)** The probabilities of X, Y and Z becoming managers are $\frac{4}{9}$, $\frac{2}{9}$ and $\frac{1}{3}$ respectively. The probabilities that the Bonus scheme will be introduced if X, Y and Z becoming managers are $\frac{3}{10}$, $\frac{1}{2}$ and $\frac{4}{5}$ respectively. **07**
- (i) What is the probability that the bonus scheme will be introduced?
- (ii) If the Bonus scheme has been introduced, what is the probability that the manager appointed was X?

OR

- Q.3 (a)** A volunteer ambulance service handles 0 to 5 service calls on any given day. The probability distribution for the number of service calls is as follows: **04**

Number of Service Calls	0	1	2	3	4	5
Probability	0.10	0.15	0.30	0.20	0.15	0.10

- a. What is the expected number of service calls?
- b. What is the variance in the number of service calls? What is the standard deviation?
- (b)** A particular train reaches the destination in time is 75 percent of the times. A person travels 5 times in that train. Find the probability that he will reach the destination in time, for all the 5 times. **03**
- (c)** The time required to pass through security screening at the airport can be annoying to travelers. The mean wait time during peak periods at Cincinnati/Northern Kentucky International Airport is 12.1 minutes. Assume the time to pass through security screening follows an exponential distribution. **07**
- a. What is the probability it will take less than 10 minutes to pass through security screening during a peak period?
- b. What is the probability it will take more than 20 minutes to pass through security screening during a peak period?
- c. What is the probability it will take between 10 and 20 minutes to pass through security screening during a peak period?

- Q.4 (a)** Define: **03**
- (i) Level of Significance (ii) Degrees of freedom
- (b)** A machine produced 20 defective articles in a batch of 400. After overhauling it produced 10 defectives in a batch of 300. Test at 5% level of significance, Has the machine improved? **04**
- (c)** The number of defects per unit in a sample of 330 units of a manufactured product was found as follows: **07**

Number of defects:	0	1	2	3	4
Number of Units:	214	92	20	3	1

Fit a Poisson Distribution to the data and test for goodness of fit at 5% level of significance.

OR

- Q.4 (a)** Give Difference between (i) One tailed and two tailed test (ii) Type-I and Type-II Error **03**
- (b)** Eleven sales executive trainees are assigned selling jobs right after their recruitment. After a fortnight they are withdrawn from their field duties and given a month's training for executive sales. Sales executed by them in thousands of rupees before and after the training, in the same period are listed below: **04**

Sales Before Training	23	20	19	21	18	20	18	17	23	16	19
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Sales After Training	24	19	21	18	20	22	20	20	23	20	27
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Test at 5% level of significance, Do these data indicate that the training has contributed to their performance?

- (c) The contingency table below summarizes the results obtained in a study conducted by a research organization, with respect to the performance of four competing brands of toothpaste among the users: 07

	Brand A	Brand B	Brand C	Brand D	Total
No Cavities	9	13	17	11	50
One to five Cavities	63	70	85	82	300
More than five Cavities	28	37	48	37	150
Total	100	120	150	130	500

Using χ^2 test at 5% level of significance test the hypothesis that incidence of cavities is independent of the brand of the toothpaste used.

- Q.5 (a) Advertisers contract with Internet service providers and search engines to place ads on Websites. They pay a fee based on the number of potential customers who click on their ad. Unfortunately, click fraud-the practice of someone clicking on an ad solely for the purpose of driving up advertising revenue-has become a problem. Forty percent of advertisers claim they have been a victim of click fraud. Suppose a simple random sample of 380 advertisers will be taken to learn more about how they are affected by this practice. 07

- What is the probability that the sample proportion will be within ± 0.04 of the population proportion experiencing click fraud?
- What is the probability that the sample proportion will be greater than 0.45?

- (b) Given the data 07

x_i	2	6	9	13	20
y_i	7	18	9	26	23

The estimated regression equation for these data is $\hat{y} = 7.6 + 0.9x$.

- What percentage of the total sum of squares can be accounted for by the estimated regression equation?
- What is the value of the sample correlation coefficient?
- Develop the 95% confidence and prediction intervals when $x = 12$.
- Explain why these two intervals are different.

OR

- Q.5 (a) List properties of Point Estimator. Explain any one in detail. 03

- (b) A simple random sample of 800 elements generates a sample proportion $\bar{p} = 0.70$. 04

- Provide a 90% confidence interval for the population proportion.
- Provide a 95% confidence interval for the population proportion.

- (c) Given the data for two variables x and y. 07

x_i	6	11	15	18	20
y_i	6	8	12	20	30

- Develop an estimated regression equation for these data.
- Compute the residuals.
- Develop a plot of the residuals against the independent variable x. Do the assumptions about the error terms seem to be satisfied?
