

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA - SEMESTER-III • EXAMINATION – WINTER • 2014

Subject Code: 630003

Date: 29-12-2014

Subject Name: Statistical Methods

Time: 10:30 am - 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.

Q.1 (a) Briefly explain the terms ‘Data’, ‘Qualitative Data’ and ‘Quantitative Data’. **07**

(b) (1) Consider the following data. **03**

8.9 10.2 11.5 7.8 10.0 12.2 13.5 14.1 10.0 12.2
 6.8 9.5 11.5 11.2 14.9 7.5 10.0 6.0 15.8 11.5

- i) Construct a frequency distribution.
- ii) Construct a histogram and an ogive.

(2) Consider the following data regarding the number of questions answered correctly by 50 candidates in an aptitude test:

112	72	69	97	107
73	92	76	86	73
126	128	118	127	124
82	104	132	134	83
92	108	96	100	92
115	76	91	102	81
95	141	81	80	106
84	119	113	98	75
68	98	115	106	95
100	85	94	106	119

Develop a stem-and-leaf display and use it to construct a frequency distribution. **04**

Q.2 (a) Consider a sample with data values of 53, 55, 70, 58, 64, 57, 53, 69, 57, 68, and 53. Compute the mean, median, mode, IQR, variance and coefficient of variation. **07**

(b) Five observations taken for two variables follow: **07**

X_i	3	12	6	20	14
Y_i	55	40	55	10	15

- (1) Develop the estimated regression equation by computing the values of b_0 and b_1 .
- (2) Use the estimated regression equation to predict the value of y when $x = 10$.

OR

(b) Given are five observations for two variables, x and y : **07**

X_i	1	2	3	4	5
Y_i	3	7	5	11	14

- (1) The estimated regression equation for these data is $\hat{y} = 0.20 + 2.60x$.
- (2) Compute SSE, SST, and SSR.
- (3) Compute the coefficient of determination r^2 . Comment on the goodness of fit.
- (4) Compute the sample correlation coefficient.

- Q.3 (a)** (1) If A, B and C are mutually exclusive and exhaustive events and if $P[A]=3P[B]=4P[C]$, then Find $P[B \cup C]$ **03**
 (2) If $P[A] = \frac{1}{2}$, $P[B] = \frac{2}{5}$, $P[A/B] = \frac{1}{5}$, find
 (i) $P[B/A]$
 (ii) $P[A' \cap B']$ **04**
- (b)** (1) A discrete random variable (x) has mean = 6 and standard deviation = $\sqrt{2}$. If it is assumed the random variable is Binomial, what is the probability that $5 \leq x \leq 7$? **04**
 (2) A person has some taxi cars and the average demand of cars per day is 3. Find the probability that on any one day not more than 2 cars are used. [Given $e^{-3} = 0.0498$] **03**

OR

- Q.3 (a)** The prior probabilities for events $A_1, A_2,$ and A_3 are $P(A_1) = 0.20, P(A_2) = 0.50,$ and $P(A_3) = 0.30$. The conditional probabilities of event B given $A_1, A_2,$ and A_3 are $P(B/A_1) = 0.50, P(B/A_2) = 0.40,$ and $P(B/A_3) = 0.30$. **07**
 (i) Compute $P(B \cap A_1), P(B \cap A_2),$ and $P(B \cap A_3)$.
 (ii) Use the tabular approach to applying Bayes' theorem to compute $P(A_1/B), P(A_2/B)$ and $P(A_3/B)$.
- (b)** (1) Compute $E(x)$ and standard deviation of the following probability distribution: **03**
- | | | | | |
|------|------|------|------|------|
| x | 2 | 4 | 7 | 8 |
| P(x) | 0.20 | 0.30 | 0.40 | 0.10 |
- (2) Phone calls arrive at the rate of 48 per hour at the reservation desk for Regional Airways and follow the Poisson Distribution.
 (i) Compute the probability of receiving three calls in a 5-minute interval of time.
 (ii) Compute the probability of receiving exactly 10 calls in 15 minutes.
 (iii) Suppose no calls are currently on hold. If the agent takes 5 minutes to complete the current call, how many callers do you expect to be waiting by that time? What is the probability that none will be waiting?
 (iv) If no calls are currently being processed, what is the probability that the agent can take 3 minutes for personal time without being interrupted by a call? **04**

- Q.4 (a)** Explain: **07**
 (i) Type – I and Type – II error
 (ii) Simple Random Sampling
 (iii) Stratified Random Sampling
- (b)** The average stock price of 50 companies belonging to an industry is Rs. 30, and the standard deviation is Rs. 8.20. Assume the stock prices are normally distributed. **07**
 (i) What is the probability a company will have a stock price of at least Rs. 40?
 (ii) What is the probability a company will have a stock price no higher than Rs. 20?
 (iii) How high does a stock price have to be to put a company in the top 10%? **07**

OR

- Q.4 (a)** How large a sample should be selected to provide a 95% confidence interval with a margin of error of 3? Assume that the population standard deviation is 9. **07**
- (b)** A simple random sample with $n = 54$ provided a sample mean of 22.5 and a sample standard deviation of 4.4. Develop a 95% confidence interval for the population mean. **07**

- Q.5 (a)** The sales data of an items in 6 shops before and after a special promotional campaign are as under: **07**

Shop	1	2	3	4	5	6
Sales Before campaign	53	28	31	48	50	42
Sales After campaign	58	29	30	55	56	45

Use the 'paired t-test' and check whether the promotional campaign can be judged as a success (i.e. have the sales increased after the promotional campaign?). Use 5% level of significance.

- (b)** Two researchers adopted different sampling techniques while investigating same group of students, to find number of students falling in different intelligence levels. The results are as follows: **07**

Researchers	No. of students in each level			
	Below average	Average	Above average	Genius
X	86	60	44	10
Y	40	33	25	2

Using χ^2 test and 5% level of significance, would you say that sampling techniques adopted by the two researchers are significantly different?

OR

- Q.5 (a)** A sample analysis of examination results of 200 M.C.A. students of a university was made. It was found that 46 students had failed. 68 secured a third division, 62 secured a second division and the rest were placed in the 1st division. Use χ^2 test and test whether this figures match with the general examination result which is in the ratio of 2:3:3:2 for various categories respectively? **07**

- (b)** A machine produces 20 defective articles in a batch of 400. After overhauling, it produced 10 defectives in a batch of 300. Use 'Z-test' to test whether the machine has improved (i.e. has the proportion of defective articles decreased after overhauling?) (Take $\alpha = 0.01$) **07**
