Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–III • EXAMINATION – SUMMER 2013

Subject Code: 630003 **Date: 15-05-2013**

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.**
4. **Use (may ask for) statistical tables wherever necessary.**

Q.1 **(a)** Fill in the blanks. **10**

i. Arithmetic operations are appropriate for _____ data. (Qualitative/Quantitative)

ii. Statistical inference refers to the process of drawing inferences about the ____ based on the characteristics of the _____ . (population, sample)

iii. A situation in which conclusions based upon aggregated crosstabulation are different from unaggregated crosstabulation is known as _____. (wrong crosstabulation, Simpson's paradox)

iv. The difference between the largest and the smallest data values is _____. (inter-quartile range, range)

v. The value which has half of the observations above it and half the observations below it is called ____. (mean, median)

vi. Standard error of point estimate of population mean is ____. ($\sigma/\sqrt{n}$, σ)

vii. P(A|B)= ____ if events A and B are independent. (0, P(A))

viii. Mean and variance of ____ variate is same. (Binomial, Poisson)

ix. The value added and subtracted from a point estimate in order to develop an interval estimate of the population parameter is known as the _____ (standard error, margin of error)

x. In general, higher confidence levels provide _____ confidence intervals. (wider/narrower)

(b) A sample of 225 account balances of a credit company showed an average balance of Rs.15,000 with a standard deviation of Rs.625. Formulate the hypotheses and compute the test statistic that can be used to determine whether the mean of all account balances is significantly different from $14,500. **04**

Q.2 **(a)** Using given marks of 8 students in a sample, compute mean, median, mode, standard deviation and coefficient of variation. **07**

Marks: 93, 65, 80, 97, 85, 87, 97, 60

(b) The following sample data contains the number of years of college and the current annual salary for a random sample of heavy equipment salespeople. **07**

Years of College	2	2	3	4	3	1	4	3	4	4
Annual Income (In Thousands)	20	23	25	26	28	29	27	30	33	35

- Mention dependent variable and independent variable.
- Determine the least square estimated regression line.
- Predict the annual income of a salesperson with five years of college.
- Calculate the coefficient of determination.

OR

(b) Following data shows prices for books and the number of pages that each book contains. **07**

Book	A	B	C	D	E	F	G
Pages (x)	500	700	750	590	540	650	480
Price (y)	7	7.5	9	6.5	7.5	7	4.5

- Develop a least-squares estimated regression line.
- Determine point estimate of mean value of price for 600 pages.
- Compute the coefficient of determination and explain its meaning.

Q.3 **(a)** i. Write necessary conditions to use normal approximation for binomial distribution. **03**

ii. The average number of calls received by a switchboard in a 30 minute period is 15. **04**

- What is the probability that the switchboard will receive exactly 10 calls between 10:00 and 10:30?
- What is the probability that the switchboard will receive fewer than 3 calls between 10:00 and 10:15?

(b) i. A local bottling company has determined the number of machine breakdowns per month and their respective probabilities as shown below. Compute expected number and variance of machine breakdowns per month. **03**

Number of breakdowns	0	1	2	3	4
Probability	0.12	0.38	0.25	0.18	0.07

ii. The daily dinner bills in a local restaurant are normally distributed with a mean Rs.30 and a standard deviation Rs.5. **04**

- What is the probability that a randomly selected bill will be at least Rs. 35?
- What is the probability that a randomly selected bill will be between Rs. 28 and Rs. 35?

OR

Q.3 **(a)** i. List properties of normal distribution. **03**

ii. Ten percent of the items produced by a machine are defective. Out of 8 items chosen at random, **04**

- Find the probability of less than 2 defective items.
- Find the probability of 4 defective items.

(b) i. The monthly earnings of computer systems analysts are normally distributed with a mean of Rs.24,300. If only 5 percent of the systems analysts have a monthly income of more than Rs. 26,140, what is the value of the standard deviation of the monthly earnings of the computer systems analysts? **03**

ii. As a company manager for ABC Corporation, there is a 0.40 probability that you will be promoted this year. There is a 0.72 probability that you will get either promotion or raise or both. The probability of getting both promotion and raise is 0.25. **04**

- What is the probability that you will get a raise?
- If you get a promotion, what is the probability that you will also get a raise?

Q.4 **(a)** i. List properties of point estimator. Explain any one in detail. **03**

ii. A simple random sample of 100 observations was taken from a large population. The sample mean and the standard deviation were determined to be 80 and 12 respectively. Compute point estimate, standard error and 95% confidence interval estimate of mean. **04**

(b) i. Determine the sample size needed to estimate mean with a margin of error of 2 or less with a .95 probability when the population standard deviation equals 11. **03**

ii. Eighty-five people in a random sample of 100 favoured Candidate A. Compute 95% and 90% interval estimate for population proportion of people in favour of candidate A. **04**

OR

Q.4 **(a)** i. List sampling methods. Explain any one in detail. **03**

ii. A local health center noted that in a sample of 400 patients 80 were referred to them by the local hospital. **04**

- Provide a 95% confidence interval for all the patients who are referred to the health center by the hospital.
- What size sample would be required to estimate the proportion of hospital referrals with a margin of error of 0.04 or less at 95% confidence?

(b) i. The time it takes a mechanic to change the oil in a car is exponentially distributed with a mean of 5 minutes. What is the probability that it will take a mechanic less than 6 minutes to change oil? **03**

ii. Following information is obtained from a random sample of 6 observations. Assume the population has a normal distribution. Observations: 13, 14, 17, 14, 17, 15. **04**

- What is the point estimate of μ?
- Construct 95% confidence interval for μ.

Q.5 **(a)** The following information was obtained from samples regarding the productivity score (out of 10) of 5 and 7 individuals using two different methods of production. **07**

Method1	8	10	14	10	13		
Method2	12	15	11	16	14	14	16

Is there a significant difference between the productivity of the two methods? Let $\alpha = 0.05$.

(b) The table below gives beverage preferences for random samples of teens and adults. **07**

	Teens	Adults	Total
Coffee	50	200	250
Tea	100	150	250
Soft Drink	200	200	400
Other	50	50	100

Test for independence between age (i.e., adult and teen) and drink preferences at $\alpha = 0.05$.

OR

Q.5 **(a)** The sales (in thousand Rs) data of an item in six shops before and after a special promotional campaign are as under: **07**

Shops	A	B	C	D	E	F
Before campaign	55	25	35	50	50	40
After campaign	60	22	30	55	58	45

Did the campaign make any significant difference in sale?

(b) The number of defects per unit in a sample of manufactured product was found as follows: **07**

No. of defects	0	1	2	3	4
No. of units	200	90	20	8	2

Fit Poisson distribution to the data and test the goodness of the fit

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