Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.C.A. Sem-III - Examination –June- 2011

Subject code:630003

Subject Name: Statistical Methods

Date:07/06/2011 **Time: 02.30 pm – 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) **Answer the following objective question.**

(1) For a population, if $\mu = 200, \sigma = 50, n = 100$ *then* find $\sigma_{\bar{x}}$. **01**

(2) If $\bar{p}$=0.3, n=100 then what is the probability that sample proportion is between 0.25 and 0.35? **01**

(3) If σ=9.65 and error is 2 then at 95% confidence level, then what will be the sample size? **01**

(4) Find Standard deviation for binomial distribution if n=10 and p=0.3. **01**

(5) What is the chance of getting at least one defective item if 3 items are drawn randomly from a lot containing 6 items of which 2 are defective items? **01**

(6) If P(A)=a, P(B)=b, and P($A \cap B$) =c then find the value of $P(A' \cap B')$. **01**

(7) If $nP_r = 336$ *and* $nC_r = 56$ then find the value of n and r. **01**

(b) **Answer the following objective question.**

(1) If A and B are mutually exclusive events then what is the value of $P(A \cap B)$ **01**

(2) The statement "$Q_1 = P_{25}$" is true or false? Explain your answer. **01**

(3) If n=50, σ=6 and sample mean is 32 then what is the confidence interval for the population mean at 90 % confidence level ? **01**

(4) Consider a sample with data values of 27, 25, 20, 15, 30, 34, 28 and 25 then what is 65th percentile? **01**

(5) Consider the hypothesis, $H_0 : \mu = 22$, $H_a : \mu \neq 22$, a sample of 75 is used and the population standard deviation is 10. Use $\alpha = 0.01$,compute p-value and state your conclusion for $\bar{x} = 23$. **01**

(6) Write the formula for finding test statistic for small sample for hypothesis test about $\mu_1 - \mu_2, \sigma_1$ *and* σ_2 unknown. **01**

(7) Following are the wages of 8 workers in rupees: **01**
50, 62, 40, 70, 45, 56, 32 and 45 then If one of the workers is selected at random, what is the probability that his wage would be lower than the average wages?

Q.2 (a) Explain the Other Sampling Methods. **07**

(b) **Answer the following objective question.**

(1) Explain Least Square Method. **03**

(2) Write the following terms for binomial distribution **04**
Properties, Probability density function, Mean and Variance.

OR

(b) **Answer the following objective question.**

(1) Write the Characteristics of the Normal Distribution **04**

(2) Define mutually exclusive event, independent event, marginal probability. **03**

Q.3 (a) **Answer the following objective question**

(1) Explain Type I and Type II error with example. **04**

(2) **Define any three:** **03**

p-value, power curve, degree of freedom, Level of Significance.

(b) **Answer the following questions:**

(1) Data on the 30 largest bond funds provides 1-year and 5-year percentage returns for the period ending March 31, 2000. Suppose we consider a 1-year return in excess of 2% to be high and a 5-year return in excess of 44% to be high. 15 of the funds had a 1-year return in excess of 2%, 12 of the funds had a 5-year return in excess of 44% and six of the funds had both a 1-year return in excess of 2% and a 5-year return in excess of 44%. **02**

(1) What is the probability that a fund has a high 1-year return or a high, 5 year return or both?

(2) What is the probability that a fund has neither a high 1-year return nor high 5-year return?

(2) Automobiles traveling on a road with a posted speed limit of 55 miles per hour are checked for speed by a state police radar system. Following is a frequency distribution of speeds. **05**

Speed (Miles per hour)	Frequency
45-49	10
50-54	40
55-59	150
60-64	175
65-69	75
70-74	15
75-79	10
Total	475

(1) What is the mean speed of the automobiles traveling on this road? Compute the variance and standard deviation.

OR

Q.3 (a) **Answer the following questions:**

(1) A shipment of 10 items has two defective and eight non defective items. In the inspection of the shipment, a sample of items will be selected and tested. If a defective item is found, the shipment of 10 items will be rejected. **03**

(1) If a sample of three items is selected, what is the probability that the shipment will be rejected?

(2) If a sample of four items is selected, what is the probability that the shipment will be rejected?

(3) If a sample of five items is selected, what is the probability that the shipment will be rejected?

(2) Find the Expected value [E($\bar{x}$)] and Standard Deviation of $\bar{x}$ [$\sigma_{\bar{x}}$] **04**

(b) The National Association of Home Builders provided data on the cost of the most popular home remodeling projects. Sample data on cost in thousands of **07**

dollars for two types of remodeling projects are as follows:

Kitchen	Master Bedroom
25.2	18.0
17.4	22.9
22.8	26.4
21.9	24.8
19.7	26.9
23.0	17.8
19.7	24.6
16.9	21.0
21.8	
23.6	

(1)Develop a point estimate of the difference between the population mean remodeling costs for the two types of projects.
(2) Develop a 90% confidence interval for the difference between the two population means.

Q.4 (a) Answer the following questions

(1) A department of transportation's study on driving speed and mileage for midsize automobiles in the following data. **04**

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.

(2) The average American spends 65.88 dollars per month dining out. A sample of young adults provided the following dining out expenditure over the past month. **03**

253	113	104	169	118
80	178	134	131	225
11	152	467	95	124
55	245	198	0	151
101	69	161	129	0

(1)Compute the mean and median
(2)Compute Inter quartile range.

(b) Answer the following questions:

(1) Phone calls arrive at the rate of 48 per hour at the reservation desk for Regional airways. **03**

(1) Compute the probability of receiving three calls in a five minute interval of time.
(2) Compute the probability of receiving exactly ten calls in fifteen minutes.
(3) If no calls are being processed, what is the probability that the agent can take three minutes for personal time without being interrupted by a call?

(2) Fifty percent of Americans think we are in a recession, even though technically we have not had two straight quarters of negative growth. For a sample of 20 Americans, make the following calculations. **04**

(1) Compute the probability that exactly 12 people think we are in a recession.
(2) Compute the probability that no more than 5 people think we are in a

recession.

(3) How many people would you expect to say we are in a recession?

(4)Compute the variance and standard deviation of the number of people who think we are in a recession.

OR

Q.4 (a) Answer the following questions:

(1) A Population has a mean of 200 and a standard deviation of 50. Suppose a simple random sample of size 100 is selected and $\bar{x}$ is used to estimate μ. **03**

(1) what is the probability that the sample mean will be within ± 5 of the population mean?

(2) what is the probability that the sample mean will be within ± 10 of the population mean?

(2) The conclusion from a 40- state poll conducted by the Joint Council of Economic Education is that students do not learn enough economics. The findings were based on test results from 11^{th} and 12^{th} grade students who took a 46- question, multiple choice tests on basic economic concepts such as profit and law of supply and demand. The following table gives sample data on the number of questions answered correctly. **04**

12	10	16	24	12	14	18	23
31	14	15	19	17	9	19	28
24	16	21	13	20	12	22	18
22	18	30	16	26	18	16	14
8	25	22	15	33	24	17	19

Summarize these data using the following:

(1) Stem and leaf display(Use class Interval of 10)

(2) Frequency distribution (Use Class Interval of 5)

(3) Relative frequency distribution

Q.4 (b) Answer the following questions:

(1) A GMAC MBA new-matriculates survey provided the following data for 2018 students. **04**

		Applied to more than one school	
Age group		YES	NO
	23 and under	207	201
	24-26	299	379
	27-30	185	268
	31-35	66	193
	36 and over	51	169

(1) Given that a person applied to more than one school, what is the probability that the person is 24-26 years old ?

(2) Given that a person is in the 36-and-over age group, what is the probability that the person applied to more than one school?

(3) What is the probability that a person is 24-26 years old or applied to more than one school?

Is the number of schools applied to independent of age? Explain.

(2) A survey of 611 office workers investigated telephone answering practices, including how often each office worker was able to answer incoming telephone calls and how often incoming telephone calls went directly to voice mail. A total 281 office workers indicated that they never need voice mail and are able to take every telephone call. **03**

(1)What is the point estimate of the proportion of the population of office workers who are able to take every telephone call?

(2) At 90% confidence, what is margin of error?

(3) What is the 90% confidence interval for the proportion of the population of office workers who are able to take every telephone call?

Q.5 (a) Answer the following questions:

(1) Consider the following hypothesis test: **04**

$H_0 : \mu = 15,\ H_a : \mu \neq 15$

A sample of 50 provided a sample mean of 14.15. The population standard deviation is 3.

(1) Compute the value of the test statistic

(2) What is the p- value?

(3) At $\alpha = 0.05$, what is your conclusion?

(4) What is the rejection rule using the critical value? What is your conclusion?

(2) Consider the following hypothesis test: **03**

$H_0 : \mu_1 - \mu_2 = 0,\ H_a : \mu_1 - \mu_2 \neq 0$

The following results are from independent samples taken from two populations.

Sample 1	Sample 2
$n_1 = 35$	$n_2 = 40$
$\bar{x}_1 = 13.6$	$\bar{x}_2 = 10.1$
$s_1 = 5.2$	$s_2 = 8.5$

(1) What is the value of the test statistic?

(2) What is the degrees of freedom for the t- distribution?

(3) What is the p- value?

(4) At $\alpha = 0.05$, what is your conclusion?

(b) Answer the following questions:

(1) One of the questions on the Business Week Subscriber Study was, "In the past 12 months, when traveling for business, what type of airline ticket did you purchase most often?" The data obtained are shown in the following contingency table. **04**

	Type of Flight	
Type of Ticket	Domestic Flights	International Flights
First Class	29	22
Business/Executive class	95	121
Full fare economy/coach class	518	135

Use $\alpha = 0.05$ and test for the independence of type of flight and type of ticket, What is your conclusion?

(2) The following data are from matched samples taken from two populations. **03**

Population		
Element	1	2
1	11	8
2	7	8
3	9	6
4	12	7
5	13	10
6	15	15
7	15	14

(1) What is the point estimate of the difference between two population means?

Provide a 95% confidence interval for the difference between two population means.

OR

Q.5 **Answer the following questions:**

(a) For the following data, **07**

X	2	3	5	1	8
Y	25	25	20	30	16

Calculate

(1)Develop a Scatter diagram for this data.

(2)Compute the estimated regression equation.

(3)Compute SSE, SST AND SSR.

(4)Compute the coefficient of determination r^2 and comment on the goodness of fit.

(b) **Answer the following questions:**

(1) Young Adult magazine states the following hypotheses about the mean of its subscribers. **03**

$H_0 : \mu = 28$

$H_a : \mu \neq 28$

1) What would it mean to make a Type II error in this solution?
2) The population standard deviation is assumed known as $\sigma = 6$ years and the sample size is 100. With $\sigma = 0.05$ what is the probability of accepting H_0 for μ equal to 26, 27, 29 and 30?
3) What is the power at $\mu = 26$? What does this result tell you?

(2) A study by Consumer Report showed that 64% of supermarket shoppers believe super market brands to be as good as national name brands. To investigate whether this result applies to its own product, the manufacturer of national name brand ketchup asked sample shoppers whether they believed that supermarket ketchup was as good as the national brand ketchup. **04**

(1) If a sample of 100 shoppers showed 52 stating that the supermarket brand was as good as the national brand, what is the p-value?

(2)If $\sigma = 0.05$ what is your conclusion?

(3) Should the national brand ketchup manufacturer be pleased with this conclusion? Explain.

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