Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.C.A -IIIrd SEMESTER–EXAMINATION – MAY- 2012

Subject code: 630003 **Date: 25/05/2012**

Subject Name: Statistical Methods (SM)

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)** Write true/false giving justification. **07**

i. Sum of squares of deviations taken from mean is zero.

ii. Correlation coefficient is a unitless measure.

iii. If two events A and B are independent, conditional probability $p(A|B) = p(A \cap B)$.

iv. Two types of ogive curves intersect at mean.

v. Finite population correction factor can be ignored when sampling fraction n/N is 0.5.

vi. For rightly skewed distribution, mean > median > mode.

vii. Random variable 'occurrences of an event over a period of time or space' follows exponential distribution.

(b) i. Survey shows that 40% of the students are using 3G mobile. In a random sample of 10 students, what is the probability that two students have 3G mobile? **03**

ii. Following data shows marks of 10 students in two subjects SM and OS. Using coefficient of variation, determine the subject in which students have consistent performance. **04**

SM	15	20	18	30	25	12	22	24	20	10
OS	12	18	20	25	20	15	25	20	15	15

Q.2 **(a)** i. Write the necessary conditions for using t-distribution. **03**

ii. A sample of items selected from normal population is 10, 5, 7, 8, 20, 25, 15, 2 and 12. Compute point estimate and 95% interval estimate of population mean. **04**

(b) i. The results of a national survey of 3000 adults showed that adults sleep for 6.9 hours a day on an average with a standard deviation 1.2 hours. Mention Chebyshev's theorem. Using it, find the percentage of adults who sleep between 4.5 and 9.3 hours per day. **03**

ii. A psychologist determined that the number of sessions required to obtain the trust of patient is either 1, 2 or 3. Let X be a random variable indicating the number of sessions required to gain patient's trust. For given probability function f(x) = **04**

(x/6) where x=1, 2 or 3; compute expected value and variance of X.

OR

	(b)	i.	For two mutually events A and B having P(A)=0.3 and P(B)=0.4, compute P(A∪B) and P(A|B).	**03**
		ii.	Using data given in Q.1(b)(ii), compute correlation coefficient to determine relationship between SM and OS marks. Interpret your result.	**04**
Q.3	**(a)**	i.	Write central limit theorem.	**03**
		ii.	Company manufactures car tyres. Mean life of tyres is 42000 km with a standard deviation of 3000 km. Company changes the production process to improve the quality. After this change, a test sample of 20 new tyres has a mean life of 43500 km with same s.d. as before. Do you think that the new car tyres are significantly superior to the earlier one?	**04**
	(b)	i.	Differentiate between cluster sampling and stratified sampling methods.	**03**
		ii.	Assume that admission test scores are normally distributed with mean 400 and σ = 100 marks. Find the probability of scores between 300 and 450.	**04**

OR

Q.3	**(a)**	i.	Describe type-I and type-II error.	**03**
		ii.	It is claimed that 20% of Indian consumers used internet to buy gifts during Diwali festival. In a sample of 900 customers this year, it is found that 15% used internet to buy gifts during Diwali. Test the claim at α = 0.05.	**04**
	(b)	i.	Explain the terms: Standard error, Margin of error.	**03**
		ii.	A machine fills containers with a particular product. Filled weights have a normal distribution with σ = 0.6 ounce. If only 2% of the containers hold less than 18 ounces, what is the population mean of weight.	**04**
Q.4	**(a)**		The following data shows sales made by salespeople from two different cities. City A: 59,68,44,71,63,46,69,54,48 City B : 50,36,62,52,70,41 Assuming the populations sampled to be approximately normal having the same variance, test whether there is any significant difference between the means of these samples.	**07**
	(b)		Customer arrivals at a bank are random and independent. The probability of an arrival in any one-minute period is same as that in any other one-minute period. Assuming mean arrival rate of five customers per minute, find the probability of	
			• Exactly three arrivals in one-minute period	**03**
			• No arrivals in half-minute period	**02**
			• Three minutes for next customer to arrive	**02**

OR

Q.4 **(a)** A company has recently created a new hair dryer A with fewer parts than the current hair dryer B. 300 units of each type of hair dryer were tested. 50 units of type A and 75 units of type B failed in a performance test. Can you conclude that new hair dryer is more reliable? **07**

(b) If the probability that a fluorescent light has a useful life of at least 500 hours is 0.85, find the probability that among 20 such lights

- At least 18 will have a useful life of at least 500 hours **03**
- Exactly 15 will have a useful life of at least 500 hours **02**
- None will have a useful life of at least 500 hours **02**

Q.5 **(a)** Using the following data, test the hypothesis that the drug is no better than sugar pills for curing cold. **07**

	HELPED	HARMED	NO EFFECT
DRUG	50	12	18
SUGAR PILLS	40	14	26

(b) Compute coefficient of determination = SSR/SST using the following data of workers. Consider salary as independent variable. Interpret your result. **07**

Salary	110	130	140	160	170	90	100	130	150
Bonus	12	15	14	15	20	12	10	12	18

OR

Q.5 **(a)** A typist in a company commits the following number of mistakes per page in typing 432 pages. Does this information verify that the mistakes are distributed according to Poisson law? **07**

No. of mistakes per page	0	1	2	3	4	5
No. of pages	223	142	48	15	4	0

(b) Using the data given in Q.5(b) above, compute point estimate and prediction interval for an individual value of bonus for salary=120. **07**

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