

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 $P(A \cup B)$ 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 $\sigma = 100$ 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 $\alpha = 0.05$. **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 $\sigma = 0.6$ 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. **07**
- 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.
- (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	22	14	4	1	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**
