

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA SEM-III Examination- Dec.-2011

Subject code: 630003**Date: 16/12/2011****Subject Name: Statistical Methods****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) 05

Define the following terms in brief:

- i. Skewness
- ii. Ogive
- iii. Correlation
- iv. Confidence Interval
- v. Mutually Exclusive Events

- (b) 04** In a study of job satisfaction, a series of tests was administered to 50 subjects. The following data were obtained: higher scores represent greater dissatisfaction. Construct a stem-and-leaf display for the data.

87	76	67	58	92	59	41	50	90	75
80	81	70	73	69	61	88	46	85	97
50	47	81	87	75	60	65	92	77	71
70	74	53	43	61	89	84	83	70	46
84	76	78	64	69	76	78	67	74	64

- (c) 05** Determine whether the following statements are **true** or **false**:

- I. One advantage of a histogram in comparison with a frequency polygon is that it more clearly shows each separate class in the distribution.
- II. The value of every observation in the data set is taken into account when we calculate its median.
- III. A measure of the peakedness of a distribution curve is the skewness.
- IV. The difference between the highest and the lowest observations in the data set is called the quartile range.
- V. The set of all possible outcomes of an experiment is called the sample space for the experiment.

Q.2 (a) 07

You are given the following frequency distribution.

Year	2002	2003	2004	2005	2006	2007	2008	2009
Dividend payment	2.2	2.4	3.0	5.0	6.8	8.1	9.0	9.8

Determine Mean, Variance, Standard Deviation, and Coefficient of

Variation

- (b) A company is considering upgrading its computer system, and a major portion of the upgrade is a new operating system. The company has asked an engineer for an evaluation of the operating system. Suppose the probability of a favourable evaluation is 0.65. If the probability the company will upgrade its system given a favourable evaluation is 0.85, what is the probability that the company will upgrade and receive a favourable evaluation? **07**

OR

- (b) A physical therapist at Gujarat Technological University knows that the football team will play 40% of its games on artificial turf this season. He also knows that a football player's chances of incurring a knee injury are 50% higher if he is playing on artificial turf instead of grass. If a player's probability of knee injury on artificial turf is 0.42, what is the probability that:
- I. A randomly selected football player incurs a knee injury?
 - II. A randomly selected football player with a knee injury incurred the injury playing on grass?

- Q.3** (a) Assuming that half of the Indian population is vegetarian. Estimate how many investigators out of 100 will report that 3 or less are vegetarian in the sample of 10 individuals. **04**
- (b) If the prices of new cars increase an average of four times every 3 years, find the probability of five or more price hikes in a randomly selected period of 3 years. **05**
- (c) In a production process the diameter of items is distributed normally with mean 4.3 cm and variance 0.09. 200 items are having less than 4 cm diameter. Estimate the total number of items in the production. **05**

OR

- Q.3** (a) The probability that a bomb dropped from an aero plane will hit the target is 0.4. Five bombs are dropped from the aero plane to destroy a bridge. 2 bombs are sufficient to destroy the bridge. What is the probability that the bridge will be destroyed? **04**
- (b) Past police records indicate a mean of 5 accidents per month at a dangerous intersection. Find out the probability of 3 accidents in a given period of one month. **05**
- (c) A machinery company has received a big order to produce electric motors for a manufacturing company. In order to fit in its bearing, the drive shaft of the motor must have a diameter of 5.1 ± 0.05 (inches). The company's purchasing agent realizes that there is a large stock of steel rods in inventory with a mean diameter of 5.07'', and a standard deviation of 0.07''. What is the probability of a steel rod from inventory fitting the bearing? **05**

- Q.4** (a) The Gujarat Technological University is conducting a study on the average weight of the many bricks that make up the University's walkways. Workers are sent to dig up and weigh a sample of 421 bricks and the average brick weight of this sample was 14.2 lb. It is a well-known fact that the standard deviation of brick weight is 0.8 lb. What is the interval around the sample mean that will include the population mean 95.5 percent of the time? **05**
- (b) In a sample of 500 people from a village, 280 are found to be rice eaters and the rest are wheat eaters. Can we assume that both the food articles are equally popular? **04**

- (c) A manufacturer supplies the rear axles for trucks. These axles must be able to withstand 80000 pounds per square inch in stress tests, but an excessively strong axle raises production costs significantly. Experience indicates that the standard deviation of the strength of its axles is 4000 pounds per square inch. The manufacturer selects a sample of 100 axles from production, tests them, and finds that the mean stress capacity of the sample is 79600 pounds per square inch. Test the hypothesis at 5% level that the sample has come from the same population. **05**

OR

- Q.4** (a) When a sample of 70 retail executives was surveyed regarding the poor November performance of the retail industry, 66 percent believed that decreased sales were due to unreasonably warm temperatures, resulting in consumers' delaying purchase of cold-weather items. Construct a 95 percent confidence interval for the true proportion. **05**
- (b) In a hospital 480 female and 520 male babies were born in a week. Do these figures confirm the hypothesis that males and females are born in equal numbers? **04**
- (c) GE has developed a new bulb whose design specifications call for a light output of 960 lumens compared to an earlier model that produced only 750 lumens. The company data indicate that the s. d. of light output for this type of bulb is 18.4 lumens. From a sample of 20 new bulbs, the testing committee found an average light output of 954 lumens per bulb. At a 0.05 significance level, can GE conclude that its new bulb is producing the specified 960 lumen output? **05**
- Q.5** (a) Nine computer-components dealers in major metropolitan areas were asked for their prices in \$ on two similar colour inkjet printers. The results of this survey are given below. At $\alpha = 0.05$, is it reasonable to assert that, on average, the Apson printer is less expensive than the Okaydata printer? **05**

Dealer	1	2	3	4	5	6	7	8	9
Apson	250	319	285	260	305	295	289	309	275
Okaydata	270	325	269	275	289	285	295	325	300

- (b) Students Safe Driving has targeted seat-belt usage as a positive step to reduce accidents and injuries. Before a major campaign at one college, 44 percent of 150 drivers entering the college parking lot were using their seat belts. After the seat-belt awareness program, the proportion using seat-belts had risen to 52 percent in a sample of 200 vehicles. At a 0.04 significance level, can the students conclude that their campaign was effective? **04**
- (c) A brand manager is concerned that her brand's share may be unevenly distributed throughout the country. In a survey in which the country was divided into four geographical regions, a random sampling of 100 consumers in each region was surveyed, with the following results: **05**

	Region				Total
	NE	NW	SE	SW	
Purchase the brand	40	55	45	50	190
Do not purchase	60	45	55	50	210
Total	100	100	100	100	400

Develop a table of observed and expected frequencies and calculate the sample χ^2 value. State the null and alternative hypotheses and test whether

brand share is the same across the four regions at $\alpha = 0.05$.

OR

- Q.5 (a)** The data below are a random sample of 9 firms chosen from the “Digest of Earnings Reports” in The Wall Street Journal on September 2011. **05**

- I. Find the mean change in earnings per share between 2010 and 2011.
- II. Find the standard deviation of the change and the standard error of the mean.
- III. Were average earnings per share different in 2010 and 2011? Test at $\alpha = 0.02$.

Firm	1	2	3	4	5	6	7	8	9
2010 earnings	1.38	1.26	3.64	3.50	2.47	3.21	1.05	1.98	2.72
2011 earnings	2.48	1.50	4.59	3.06	2.11	2.80	1.59	0.92	0.47

- (b)** A manufacturer of pet foods was wondering whether cat owners and dog owners reacted differently to premium pet foods. They commissioned a consumer survey that yielded the following data: **04**

Pet	Owners Surveyed	No. Using Premium Food
Cat	280	152
Dog	190	81

Is it reasonable to conclude, at $\alpha = 0.02$, that cat owners are more likely than dog owners to feed their pets premium food?

- (c)** An advertising firm is trying to determine the demographics for a new product. They have randomly selected 75 people in each 5 different age groups and introduced the product to them. The results of the survey are given below: **05**

Future Activity	Age group				
	18-29	30-39	40-49	50-59	60-69
Purchase frequently	12	18	17	22	32
Seldom purchase	18	25	29	24	30
Never purchase	45	32	29	29	13

Develop a table of observed and expected frequencies, and calculate X^2 value. For the level of significance is 0.01, should the null hypothesis be rejected?
