

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**MBA Semester –I Examination Dec'11- Jan'12**

**Subject code: 810007****Date: 10/01/2012****Subject Name: Quantitative Analysis (QA)****Time: 10.30 am – 01.30 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)** The radio music listener market is diverse .Listener for mats might include **07**  
adult contemporary, album rock, top 40, oldies, rap, country and western,  
classic, and jazz. In targeting audience, market researchers need to be  
concerned about the ages of the listener attracted to particular formats. Suppose  
a marketer researcher surveyed a sample of 170 listener of oldies stations and  
obtained the following age distribution.

| Age         | Frequency |
|-------------|-----------|
| 15-under 20 | 9         |
| 20-under 25 | 16        |
| 25-under 30 | 27        |
| 30-under 35 | 44        |
| 35-under 40 | 42        |
| 40-under 45 | 23        |
| 45-under 50 | 7         |
| 50-under 55 | 2         |

- I. What are the mean and modal ages of oldies listeners?
  - II. What are the variance and standard deviation of the age's oldies  
listeners?
- (b)** A doctor has decided to prescribe two new drugs to 200 heart patients as **07**  
follows: 50 get drug A, 50 get drug B , and 100 get both. The 200 patients were  
chosen so that each had an 80 percent chance of having a heart attack if given  
neither drug. Drug A reduces the probability of a heart attack by 35 percent,  
drug B reduces the probability by 20 percent and the two drugs, when taken  
together, work independently .if a randomly selected patient in the program has  
a heart attack, What is the probability that the patient was given both drugs?

- Q.2 (a)** (1) State chebyshev's theorem **04**  
(2) Characteristics of good estimator. **03**
- (b)** The average number of annual trips per family to amusement parks in the India **07**  
is Poisson distributed, with a mean of 0.6 trips per year. What is the probability  
of randomly selecting an Indian family and finding the following:
- I. The family did not make a trip to an amusement park last year?
  - II. The family took exactly one trip to an amusement park last year?
  - III. The family took two or more trips to amusement parks last year?
  - IV. The family took three or fewer trips to amusement parks over a three –  
year period?
  - V. The family took exactly four trips to amusement parks during a six –  
year period?

**OR**

- (b) Suppose you are sampling from a population with population standard deviation = 1000. You want the standard deviation of the sample mean to be at most 25. What is the minimum sample size you should use? **07**

- Q.3** (a) Two different areas of a large eastern city are being considered as sites for day-care centers. Of 200 households surveyed in one station, the proportion in which the mother worked full-time was 0.52. In another section, 40 % of the 150 households surveyed had mothers working at full-time jobs. At the 0.04 level of significance, is there a significant difference in the proportion of working mothers in the two areas of the city? **07**
- (b) A research company has designed three different systems to clean up oil spills. The following table contains the results, measured by how much surface area (in square meters) is cleaned in 1 hour. The data were found by testing each method in several trials. Are the three systems equally effective? Use the 0.05 level of significance **07**
- System A   55   60   63   56   59   55  
 System B   57   53   64   49   62  
 System C   66   52   61   57

**OR**

- Q.3** (a) Suppose that in past years the average price per square foot for warehouses in the India has been Rs 32.28. A national real estate investor wants to determine whether that figure has changed now. The investor hires a researcher who randomly samples 19 warehouses that are for sale across the India and finds that the mean price per square foot is Rs 31.67, with a standard deviation of Rs 1.29. If the researcher uses a 5% level of significance, what statistical conclusion can be reached? What are the hypotheses? **07**
- (b) A management consulting company presents a three-day seminar on project management to various clients. The seminar is basically the same each time it is given. However, sometimes it is presented to high-level managers, sometimes to midlevel managers, and sometimes to low-level managers. The seminar facilities believe evaluations of the seminar may vary with the audience. Suppose the following data are some randomly selected evaluation scores from different levels of managers who attended the seminar. The ratings are on a scale from 1 to 10, with 10 being the highest. Use a one-way ANOVA to determine whether there is a significant difference in the evaluations according to manager level. Assume  $\alpha = 0.05$ . Discuss the business implications of your findings. **07**

| High level | Mid level | Low level |
|------------|-----------|-----------|
| 7          | 8         | 5         |
| 7          | 9         | 6         |
| 8          | 8         | 5         |
| 7          | 10        | 7         |
| 9          | 9         | 4         |
|            | 10        | 8         |
|            | 8         |           |

- Q.4 (a)** Study the MINITAB regression output that follows. How many predictors are there? What is the equation of the regression model? Find out the strength of the model and the predictors. **07**

Regression Analysis: Y versus X1, X2, X3, X4

The regression equation is

$$Y = -55.9 + 0.0105 X1 - 0.107 X2 + 0.579 X3 - 0.870 X4$$

| Predictor | coef     | SE      | coef | T     | P     |
|-----------|----------|---------|------|-------|-------|
| Constant  | -55.93   | 24.22   |      | -2.31 | 0.025 |
| X1        | 0.01049  | 0.02100 |      | 0.50  | 0.619 |
| X2        | -0.10720 | 0.3503  |      | -3.06 | 0.003 |
| X3        | 0.57922  | 0.07633 |      | 7.59  | 0.000 |
| X4        | -0.8695  | 0.1498  |      | -5.81 | 0.000 |

S = 9.025      R-sq = 80.2%   R-sq(adj) = 78.3%

Analysis of Variance

| Source         | DF | SS      | MS     | F     | P     |
|----------------|----|---------|--------|-------|-------|
| Regression     | 4  | 18088.5 | 4522.1 | 55.52 | 0.000 |
| Residual Error | 55 | 4479.7  | 81.4   |       |       |
| Total          | 59 | 22568.2 |        |       |       |

- (b)** Use the following contingency table and the chi-square test of independence to determine whether social class is independent of number of children in a family. Let  $\alpha=0.05$ . **07**

|                    |             | Social Class |        |       |
|--------------------|-------------|--------------|--------|-------|
| Number of children |             | Lower        | Middle | Upper |
|                    | 0           | 7            | 18     | 6     |
|                    | 1           | 9            | 38     | 23    |
|                    | 2 or 3      | 34           | 97     | 58    |
|                    | More than 3 | 47           | 31     | 30    |

**OR**

- Q.4 (a)** campus store has been selling the *believe it or not : wonders of statistics study guide* for 12 semesters and would like to estimate the relationship between sales and number of sections of elementary statistics taught in each semester. The following data have been collected: **07**

| Sales(units) | Number of sections |
|--------------|--------------------|
| 33           | 3                  |
| 38           | 7                  |
| 24           | 6                  |
| 61           | 6                  |
| 52           | 10                 |
| 45           | 12                 |
| 65           | 12                 |
| 82           | 13                 |
| 29           | 12                 |
| 63           | 13                 |
| 50           | 14                 |
| 79           | 15                 |

- (1) Develop the estimating equation that best fits the data
- (2) Calculate the sample coefficient of determination and the sample coefficient of correlation

- (b) The following information has been gathered from a random sample of apartment renters in a city. We are trying to predict rent (in dollars per month) based on the size of the apartment (number of rooms) and the distance from downtown (in miles.) 07

| Rent (\$) | No. of Rooms | Distance from Downtown |
|-----------|--------------|------------------------|
| 360       | 2            | 1                      |
| 1000      | 6            | 1                      |
| 450       | 3            | 2                      |
| 525       | 4            | 3                      |
| 350       | 3            | 10                     |
| 300       | 1            | 4                      |

- Calculate the least-squares equation that best relates these three variables.
- If someone is looking for a two-bedroom apartment 2 miles from downtown, what rent should he expect to pay

- Q.5 (a)** Janak Bhai, owner of a California vineyard, has collected the following information describing the prices and quantities of harvested crops for the years 1992-1995. 07

|               | Price (per ton) |       |       |       | Quantity Harvested (tons) |      |      |      |
|---------------|-----------------|-------|-------|-------|---------------------------|------|------|------|
| Type of Grape | 1992            | 1993  | 1994  | 1995  | 1992                      | 1993 | 1994 | 1995 |
| Ruby cabernet | \$108           | \$109 | \$113 | \$111 | 1280                      | 1150 | 1330 | 1360 |
| Barbera       | 93              | 96    | 96    | 101   | 830                       | 860  | 850  | 890  |
| Chenin Blanc  | 97              | 99    | 106   | 107   | 1640                      | 1760 | 1630 | 1660 |

Calculate a fixed – weight index for each year using 1992 prices as the base and the 1995 quantities as the fixed weight.

- (b) Use the decision table given here to complete parts (a) through (d). 07

|                      |    | State of Nature |     |     |
|----------------------|----|-----------------|-----|-----|
|                      |    | S1              | S2  | S3  |
| Decision Alternative | d1 | 250             | 175 | -25 |
|                      | d2 | 110             | 100 | 70  |
|                      | d3 | 390             | 140 | -80 |

- Use the maximax criterion to determine which decision alternative to select.
- Use the maximin criterion to determine which decision alternative to select.
- Use the Hurwicz criterion to determine which decision alternative to select. Let  $\alpha = 0.3$  and then let  $\alpha = 0.8$  and compare the results.
- Compute an opportunity loss table from the data. Use this table and a minimax regret criterion to determine which decision alternative to select.

**OR**

|                         |    | State of Nature |           |           |
|-------------------------|----|-----------------|-----------|-----------|
|                         |    | s1(0.40)        | s2 (0.35) | s3 (0.25) |
| Decision<br>Alternative | d1 | 150             | 250       | 500       |
|                         | d2 | 100             | 200       | 400       |
|                         | d3 | 75              | 150       | 700       |
|                         | d4 | 125             | 450       | 650       |

1. Draw a decision tree to represent this payoff table.
2. Compute the expected monetary values for each decision and label the decision tree to indicate what the final decision would be.
3. Compute the expected payoff of perfect information.  
Compare this answer to the answer determined in part (2) and compute the value of perfect information.

- (b) The number of faculty-owned personal computers at the University of Ohio increased dramatically between 1990 and 1995: 07

| Year          | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---------------|------|------|------|------|------|------|
| Number of PCs | 50   | 110  | 350  | 1020 | 1950 | 3710 |

Develop a linear estimating equation that best describes these data.

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