

2011

M B A

1st Semester Examination

QUANTITATIVE METHODS

PAPER—MBA-103

Full Marks : 100

Time : 3 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Write the answers to Questions of each Half in separate books.

(First Half)

(Marks : 50)

1. Answer any four questions from the following : 5×4
- (a) What do you understand by Histograms Frequency Polygon and Ogive ?
 - (b) Prove that the correlation coefficient does not depend on the origin or scale of the observations.

(Turn Over)

- (c) Find the mean and the standard deviation of the first 'n' natural numbers.
- (d) Examine whether Laspeyre's and Passche's price index satisfies time reversal and factor reversal test.
- (e) Differentiate between
- (i) Variable and attribute, and
 - (ii) Primary data and secondary data.
- (f) Prove that standard deviation is independent of any change of origin, but is dependent on the change of scale.
2. Answer any *two* questions from the following : 10×2
- (a) (i) Find the mean and variance of Poisson distribution.
- (ii) The mean and standard deviation of 20 items is found to be 10 and 2 respectively. At the time of checking it was found that one item 8 was incorrect. Calculate the mean and standard deviation if it is replaced by 12 and if the wrong item is omitted. 5+5
- (b) (i) Prove that the standard deviation calculated from two values x_1 and x_2 of a variable x is equal to half of their difference. 4
- (ii) When two unbiased coins are tossed, what is the

probability of obtaining 3 heads and not more than 3 heads. ? 4

- (iii) If two groups contain n_1 and n_2 observations with means \bar{x}_1 \bar{x}_2 and standard deviations σ_1 and σ_2 respectively then what is the standard deviation of the composite group, taking n_1 and n_2 observations together? 2

- (c) (i) Find the correlation coefficient between x and y.

| | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|
| x : | 5 | 7 | 9 | 11 | 13 | 15 |
| y : | 1.7 | 2.4 | 2.8 | 3.4 | 3.7 | 4.4 |

3

- (ii) Calculate arithmetic mean, and median of the frequency distribution given below. Hence calculate the mode using empirical relation between the three. 5

| | | | | | | | |
|------------------|---------|---------|---------|---------|---------|---------|---------|
| Class limits : | 130-134 | 135-139 | 140-144 | 145-149 | 150-154 | 155-159 | 160-164 |
| Freq- uency : | 5 | 15 | 28 | 24 | 17 | 10 | 1 |

- (iii) Mention the various mathematical curves and its mathematical forms for determining trend to time series data. 2

[Internal Assessment : 10 Marks]

(Second Half)

(Marks : 50)

3. Answer any four of the following questions : 5×4

- (a) Why is square evaluation of empty cells made in solving a transportation problem? If you commit a mistake in evaluating an empty cell in any of the iterations, can you ever reach the right optimal solution without detecting the mistake?
- (b) What do you mean by 'empty queue' and 'non-empty queue'? Give the formulae to determine the average length of both of these two types of queues.
- (c) How can you resolve the following problems faced by you after having obtained the optimal solution of a linear programming problem by simplex method?
- (i) Unit contribution of a product has declined from that you estimated.
 - (ii) You want to drop a product from your product line that is not selling well.
- (d) What are the different types of inventory cost? How do they behave?
- (e) Demonstrate the process to handle a situation that gives rise to alternative solutions to an assignment

problem.

- (f) 'Dual of a dual is the Primal of a LPP'. Explain the statement. Write the dual of the following LPP :

$$\text{Minimise } Z = 6x_1 + 4x_2 + 6x_3 + x_4$$

$$\text{Subject to : } 4x_1 + 4x_2 + 4x_3 + 8x_4 = 21$$

$$3x_1 + 17x_2 + 80x_3 + 2x_4 \leq 48$$

Where x_1 and $x_2 \geq 0$, x_3 and x_4 are unrestricted.

4. Answer any two of the following questions : 10×2

- (a) The following table gives the cost of transporting materials from supply points A, B, C and D to demand points E, F, G, H, and I.

| To→ From ↓ | E | F | G | H | I | Availability (Units) |
|----------------------------|-----------|------------|-----------|------------|------------|-------------------------|
| A | 8 | 10 | 12 | 17 | 15 | 100 |
| B | 15 | 13 | 18 | 11 | 9 | 150 |
| C | 14 | 20 | 6 | 10 | 13 | 180 |
| D | 13 | 19 | 7 | 6 | 12 | 280 |
| Demands (Units) | 90 | 170 | 50 | 210 | 190 | |

The present allocation is as follows :

A to E - 90; A to F - 10; B to F - 150; C to F - 10;

C to G - 50; C to I - 120; D to H - 210; D to I - 70.
Check if this allocation is optimum. If not, find the optimum schedule.

- (b) A furniture maker has 6 units of wood and 28 hours of free time, with which he will make decorative screens. Two models were sold well in the past; so he will restrict himself to those two models only. He estimates that model - I require 2 units of wood and 7 hours of time, while model - II requires 1 unit of wood and 8 hours of time. The prices of the model I and II are Rs. 120 and Rs. 80 respectively. The problem before the furniture maker is to determine the number of assembled screens of each model to maximise his sales revenue.

Formulate it as a linear programming problem and then solve it.

- (c) A company can produce an item or buy it from a contractor. If it is produced, it will cost Rs. 20 per set up. The production rate is 100 units per day. If it is bought from the contractor, it will cost Rs. 15 to place an order. The cost of maintaining the item in stock, whether bought or produced, is Re. 0.02 per day. The company's usage is estimated as 26,000 units per annum. Should the item be bought or produced?

[Internal Assessment : 10 Marks]