2016

M.Com. 1st Semester Examination

QUANTITATIVE TECHNIQUES FOR MANAGERIAL DECISIONS

PAPER-COM-103

Full Marks: 50

Time: 2 Hours

The figures in the margin indicate full marks.

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

Illustrate the answers wherever necessary.

Unit - I
[Marks: 20]

1. Answer any two of the following questions:

 2×5

(a) What do you mean by 'Dual' in linear programming? Write the Dual for the following linear programming problem.

Minimize
$$Z = 4x_1 + x_2$$

Subject to $3x_1 + x_2 \le 2$
 $4x_1 + 3x_2 \ge 6$
 $x_1 + 2x_2 \le 3$
where $(x_1, x_2) \ge 0$. 2+3

- (b) Explain, with the help of example, all the situations when you have to take help of 'dummy' in solving an assignment problem.
- (c) Prove that the evaluations of empty cells (for Optimality Test) under Stepping Stone Method and 'Modi Method' or 'uv Method' are the same in magnitude but opposite in sign. Assume a 4×4 matrix with imaginary figures.

3+2

(d) What is the prime objective of a travelling salesman problem? What assumptions are commonly made in solving such a problem?

2. Answer any one of the following questions:

 10×1

(a) A company solicits bids on each of four projects from five contractors. Only one project may be assigned to any contractor. The bids received (in thousands of rupees) are given in the accompanying table. Contractor D feels unable to carry out project 3 and, therefore, submits no bid.

Project	Contractor					
	A	В	С	D	E	
1	18	25	22	26	25	
2	26	29	26	27	24	
3	28	31	30	<u> </u>	31	
4	26	28	27	26	29	

- (i) Use the Hungarian method to find the set of assignments with the smallest possible total cost.
- (ii) What is the minimum total achievable cost?

8+2

(b) Three products — A, B and C have to be processed by three machines M₁, M₂ and M₃. Available machine hours for the three machines, machine hour requirements per unit of each product, and profit per unit of each product are given in the following table:

Machine	Machines Ho	Available		
	Product A	Product B	Product C	Hours
M ₁	1	1	1	100
M ₂	10	4	5	600
M ₃	2	2	6	300
Profit per unit (Rs.)	100	60	40	

Write down the complete linear programming formulation of the problem and determine the optimum feasible solution.

Unit - II [Marks : 20]

3. Answer any two of the following questions:

5×2

(a) Write a short note on time-cost trade off in network analysis.

- (b) Self-service at a university canteen, at an average rate of 7 minutes per customer, is slower than attendant service, which has a rate of 6 minutes per student. The manager of the canteen wishes to calculate the average number of customers in the canteen, the average time each customer spends waiting for service. Assume that customers arrive randomly at each time, at the rate of 5 per hour.
- (c) State the mportance of inventory management. What do you mean by shortage cost or stock out cost? 3+2
- (d) A project has the following activities:

<u>Activity</u>	Duration (Days)
1 - 2	20
1-3	25
2 - 3	10
2 - 4	12
3 – 4	5
4 – 5	10

Required:

- (i) Draw the project network.
- (ii) Find the critical path and total project duration.
- (iii) Find earliest and latest time.

2+1+2

4. Answer any one of the following questions:

 10×1

(a) (i) State the concept of 'Quantity Discounts' in inventory management. Mention the merits and demerits in buying large quantities of inventory.

3+2+5

- (ii) An unit is used at the rate of 100 per day and can be manufactured at a rate of 600 per day. It costs Rs. 2000 to set up and Re 0.1 per unit per day held in inventory based on the actual inventory any time. Shortage is not allowed. Find the minimum cost and the optimum number of units per manufacturing run.
- (b) The following table gives the activities and other relevant data for a project:

Activity	Normal time (days)	Crash time (days)	Normal Cost (Rs.)	Crash cost (Rs.)
1 – 2	6	4	600	1000
1 - 3	4	2	600	1400
2 - 4	5	3	500	1500
2 - 5	3	1	450	650
3 – 4	6	4	900	2000
4~6	8	4	800	3000
5-6	4	2	400	1000
6 – 7	3	2	450	800

The contract includes a penalty clause of Rs. 200 per day in excess of 19 days. The overhead cost is Rs. 400 per day.

- (i) Draw the project network and determine the critical path.
- (ii) Find the normal duration and cost of the project.
- (iii) Find the optimum duration and cost of the project. 2+4+4

[Internal Assessment — 10]