2019
M. Com.
1st Semester Examination
QUANTITATIVE TECHNIQUES FOR MANAGERIAL DECISION
PAPER – COM – 103
Full Marks : 50

Time : 2 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.

UNIT – I

1. **Answer any two questions:**   **2 X 2**

    a) Define surplus variable in LPP.

    b) What is an unbalanced transportation problem?

    c) Find the dual of the following problem:
    Min $Z = 4x_1 + 2x_2 + 3x_3$
    Subject to: $x_1 + 2x_2 \geq 3$
    $x_2 - 3x_3 \geq 6$
    $-x_1 + 3x_2 - 2x_3 \leq 3$
    Provided that $x_1, x_2, x_3 \geq 0$

    d) What is multiple optimal solution to an assignment problem?

2. **Answer any two questions**   **2 × 4 = 8**

    a) In a job shop operation, 5 jobs may be performed on any 4 machines. The hours required for each job on each machine are presented in the following table:

Job	Machine 1	Machine 2	Machine 3	Machine 4
A	13	14	16	10
B	12	13	15	12
C	11	12	12	09
D	16	16	18	14
E	10	12	13	12

    The plant foreman would like to assign the jobs so that the total time is minimized. Find the optimal solution.

(Turn Over)

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6. **Answer any one question**   **1 × 8 = 8**

    a) Find the optimal order quantity for a product for which the price discounts are:

Order Quantity	Unit Price (Rs.)
$0 \leq Q < 500$	10
$500 \leq Q < 750$	9.25
$750 \leq Q$	8.75

    The monthly demand for the product is 200 units, storage cost is 2% of unit cost and cost of ordering is Rs.100.

    b)

Activity	Normal		Crash	
	Time (Week)	Cost (Rs.)	Time (Week)	Cost (Rs.)
1-2	9	12000	6	18000
1-3	14	1600	13	1800
2-4	4	2000	3	2400
2-5	14	14000	4	24000
3-6	6	4000	6	4000
4-5	6	44000	4	56000
5-6	5	4000	3	4800
6-7	2	12000	1	14000

Indirect cost is Rs.2000 per week.

    i) Draw network diagram and identify critical path.
    ii) What is the normal project duration and associated cost?
    iii) Crash the relevant activities systematically and determine optimum project time and cost.

(Internal Assessment :10 marks)

b) Write notes on Modified Distribution Method (MODI) are getting optimal solution of an initial feasible solution of a transportation problem.

c) A company has 4 factories at F_1, F_2, F_3, which supply 3 warehouses (W_1, W_2, W_3)

	W_1	W_2	W_3	Supply
F_1	16	20	12	200
F_2	14	08	18	160
F_3	26	24	16	90
Demand	180	120	150	350

Determine the optimal distribution for the company to minimize shipping cost.

d) Explain in brief three methods of obtaining initial feasible solution for transportation problem.

3. **Answer any one question** $1 \times 8 = 8$

a) Solve the following LPP by simplex method:

Max $Z = x_1 + x_2 + 3x_3$

Subject to:

$$3x_1 + 2x_2 + x_3 \leq 3$$
$$2x_1 + x_2 + 2x_3 \leq 2$$

Provided that $x_1, x_2, x_3 \geq 0$

b) AZ company has decided to carry out road repairs on main 4 arteries of the city. The Govt. has assigned to make a special grant of Rs.50 lakhs for repairs with lowest cost and fastest time. The company has floated tenders and 5 contractors have sent in their bids. In order to expedite work, one road will be awarded to only one contractor.

Contractors / Road		Cost of Repairs (Rs.)			
		R_1	R_2	R_3	R_4
	C_1	09	14	19	15
	C_2	07	17	20	19
	C_3	09	18	21	18
	C_4	10	12	18	19
	C_5	10	15	21	16

Find the best way of assigning repair work to the contractor and also calculate the cost.

Continued

UNIT – II (20 Marks)

4. **Answer any two questions** $2 \times 2 = 4$

a) What do you mean by Forward Pass and Backward Pass in network analysis?

b) What do you mean crashing in network analysis?

c) State two objectives of inventory management.

d) Define re-order level.

5. **Answer any two questions** $2 \times 4 = 8$

a) Draw network from the following activities and find the critical path and total duration of the project:

Activity	Duration (Days)	Activity	Duration (Days)
1-2	3	3-4(Dummy)	0
2-3	4	4-5	2
2-4	5	5-6	3
2-5	3		

b) Mention the merits and demerits of quantity discounts in inventory control.

c) The following information is given to you:

Annual demand = 3200 units, Unit cost = Rs.6, Carrying charge = 25%, Cost of one procurement = Rs.150.

You are required to compute (i) EOQ (ii) Time between two consecutive orders.

d) Mean arrival rate is 18 per hour. Mean service rate is 23 per hour.

Determine:

i)   Average time a customer will wait in the system.

ii)   Average number of customers waiting the queue.

iii)   Utilization factor of the system.