2013

M. Com.

1st Semester Examination

OPERATIONS RESEARCH

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.

Illustrate the answers wherever necessary.

Unit—I

[Marks : 20]

1. Answer any *two* of the following questions :   5×2

   (a) What do you mean by transportation problem ? Write down the usual transportation tableau.   2+3

   (b) How would you deal with the assignment problems where

       (i) Some assignments are prohibited ?

       (ii) The objective function is of maximisation type ?
          $2\frac{1}{2}+2\frac{1}{2}$

(c) How could you know the existence of an alternative optimum solution in a transportation problem ? How can you derive the alternative solution ? Can there be any use of an alternative solution ?   1+2+2

(d) Graphically (manually drawn) solve the following linear programming problem :

Minimize $Z = 5x_1 + 4x_2$

Subject to : $x_1 - 2x_2 \leq 1$; $x_1 + 2x_2 \geq 3$

Where $(x_1, x_2) \geq 0$.   5

2. Answer any *one* of the following :   10×1

(a) A salesman has to visit five cities. The costs involved in visiting different cities from other cities are represented in the following matrix.

		To City (Cost in Rs.)				
		A	B	C	D	E
From City	A	–	25	32	34	35
	B	26	–	31	35	29
	C	32	33	–	34	31
	D	28	21	30	–	25
	E	28	32	28	36	–

Determine the optimum sequence the salesman should follow to minimise the total costs for visiting all the cities in a single trip. Find out the total costs involved.

(Continued)

(b) Three types of cutting tools are produced in a factory using a lathe, a grinder, and a polisher. The duration in hours required to produce one batch of tools on each of these machines are given in the following table along with costs, selling prices of each batch of tools and the minimum number of hours available on each machine per week.

Type of Tools	Processing time (hrs.) per batch			Cost per batch (Rs.)	Selling price per batch (Rs.)
	Lathe	Grinder	Polisher		
A	7	2	5	100	145
B	3	3	8	65	100
C	4	4	2	80	120
Maximum hours per week	50	40	80		

Determine the optimum production schedule and maximum profit per week.

Unit—II

[Marks : 20]

3. Answer any *two* of the following questions : 5×2

(a) Briefly explain the following in relation to Queueing Theory.

   (i) Kindall's Notation.

   (ii) Queue Discipline.

$$2\frac{1}{2}+2\frac{1}{2}$$

(b) State the importance of inventory management. What do you mean by shortage cost or stock out cost ?

3+2

(c) A company distributes its products by trucks loaded at its only loading station. Both, company's trucks and contractor's trucks are used for this purpose. It was found out that on an average every 5 minutes one truck arrived and the average loading time was 3 minutes. 50% of the trucks belong to the contractor.

Find out :

   (i) the probability that a truck has to wait;

   (ii) the waiting time of truck that waits;

   (iii) the expected waiting time of contractor's trucks per day (before being loaded), assuming a 24 hours shift.

$$1\frac{1}{2}+1\frac{1}{2}+2$$

(Continued)

(d) Write a short note on time-cost trade off in the context of Critical Path Method Analysis.

5

4. (a) The following table gives the activities in a construction project.

Activity	Immediate predecessor(s)	Time (days)
A	—	4
B	—	6
C	—	2
D	A	5
E	C	2
F	A	7
G	D, B, E	4

(i) Obtain earliest start, earliest finish, latest start and latest finish time for all the stages.

(ii) Find the critical path and project time duration.

(iii) Tabulate total float, free float and independent float.

3+2+5

(b) The Princeton Company has a contract to supply 5,000 units of an item per year to a dealer. For this item, the company estimates that the ordering cost is Rs. 150 every time that an order is made while the carrying cost (p.a.) is reckoned to be 20 per cent of the unit price.

The company is negotiating with a dealer who offers to give the following quantity discount.

Order size	Price per unit (Rs.)
Less than 1,000	500
1,000 – 2,999	450
3,000 – 4,999	400
5,000 or more	350

Recommend to the company the best inventory policy with regard to this item.

10

[Internal Assessment : 10 Marks]