

2009

M. Com.

1st Semester Examination

OPERATIONS RESEARCH

PAPER — CM-1103

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 : 5×2
- (a) How can you modify an assignment technique to solve a travelling salesman problem ?
- (b) Describe any one method to evaluate empty cells in a transportation problem, to test optimality.
- (c) Convert the following lpp into its dual form :

$$\text{Max } z = 6x_1 + 5x_2 + x_3 + 10x_4$$

$$\text{s.t. } 4x_1 + 5x_2 + 7x_3 \leq 5$$

$$3x_1 + 7x_3 \leq 10$$

$$2x_1 + 3x_2 + 8x_3 = 15$$

$$2x_2 + 9x_3 \geq 5$$

Where $x_i \geq 0$, $i = 1, 3$. x_2 unrestricted.

How can a product be deleted from the optimum solution table in simplex method ?

(Turn Over)

(d) What is 'Artificial Variable'? Describe its use in linear programming.

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

(a) A company produces two products A and B each of which requires three types of processing. The length of time for processing each unit and the profit per unit are given in the following table :

	Product A	Product B	Available capacity per day
	(hr./unit)	(hr./unit)	(hr)
Processes I	120	120	8,400
Processes II	30	60	3,000
Processes III	80	40	4,800
Profit per unit (Rs.)	50	70	

How many units of each product should the company produce per day in order to maximise the profit? Solve the problem by simplex method in linear programming.

(b) A company has three warehouses A, B and C, and four stores — W, X, Y and Z. The supplies from the warehouses, the needs of the stores, and the transportation costs per unit are given in the following table :

Store Warehouses	→ W	X	Y	Z	Suppliers
A	50	150	70	60	30
B	80	60	90	10	70
C	15	87	79	81	40
Need	20	60	50	20	

Work out the optimum transportation schedule and determine the associated cost. Use Vogel's method.

Unit—II
[Marks : 20]

3. Answer any *two* of the following : 5×2
- (a) Write a note on different time estimates in PERT and also mention their uses in computing different types of floats.
- (b) Explain with the help of graph (manually drawn) the economic lot size model with finite rate of replenishment. Write the formulae to compute Optimum Ordering Quantity, Optimum time interval between two successive orders and Optimum Inventory Cost.
- (c) What are the steps to be followed to relax the project duration in Network analysis ?
- (d) What do you understand by 'Input Process' in queuing theory? What are the characteristics of Input Process ?
4. Answer any *one* of the following : 10×1
- (a) The data about normal and crash estimates relating to a Project are given below :

Activity	Predecessor Activity	Normal		Crash	
		Time (days)	Cost (Rs.)	Time (days)	Cost (Rs.)
A	—	8	450	7	490
B	—	6	400	4	490
C	B	5	300	4	350
D	A	4	500	3	585
E	C, D	7	475	5	625
F	A	8	600	6	740
G	B	2	150	2	150
H	E, F	5	350	4	420

Indirect cost per day : Rs. 100.

Draw the network, crash the activities systematically and determine the optimum project completion time and cost.

- (b) (i) What is traffic intensity? If traffic intensity of a system is given to be 0.76, what percent of time the system would be idle?
- (ii) Arrivals at a telephone booth are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of phone call is assumed to be distributed exponentially, with a mean of 4 minutes. What is the probability that a person arriving at the booth will have to wait?

The telephone department will install a second booth when convinced that an arrival would expect waiting for at least 3 minutes for phone. By how much should the flow of arrivals increase in order to justify a second booth?

[Internal Assessment : 10 Marks]
