(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2786 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VII) ODD SEMESTER THEORY EXAMINATION 2012-13

OPERATIONS RESEARCH

Time : 3 Hours *Total Marks : 100*

Note : *(1) Attempt **all** the questions.*

(2) They carry equal marks.

1. Attempt any **two** parts of the following questions :

(a) Verify that the following linear programming problem has an unbounded optimal solution :

(i) graphically

(ii) Using the Simplex method :

Maximize $11x_1 + 7x_2$

subject to

$$5x_1 + 2x_2 \geq 20$$

$$3x_1 - 4x_2 \leq 12$$

$$x_1, x_2 \geq 0.$$

(b) Write the dual of the above problem.

(c) Consider the following linear programming problem :

Maximize $2x_1 + 12x_2 + 7x_3$

subject to $x_1 + 3x_2 + 2x_3 \leq 10000$

$$2x_1 + 2x_2 + x_3 \leq 4000$$

$$x_1, x_2, x_3 \geq 0.$$

The optimal solution is shown below, where z is the objective function and x_4 and x_5 are slack variables :

	z	x_1	x_2	x_3	x_4	x_5	RHS
z	1	12	2	0	0	7	28000
x_4	0	−3	−1	0	1	−2	2000
x_5	0	2	2	1	0	1	4000

(i) Suppose that the right-hand-side of the second constraint is changed to $4000 + \Delta$. What is the range of Δ that will keep the basis of the foregoing tableau optimal ?

(ii) Find explicitly the optimal value z as a function of Δ for part (i).

2. Answer any **two** of the following :

(a) What will be the effect of subtracting 'a_i' from each column and a constant 'b_i' from each row of an assignment matrix $\{C_{ij}\}$. Prove the same mathematically.

(b) Construct a basic feasible solution by the North-West corner method and then find the optimal solution for the following transportation problem :

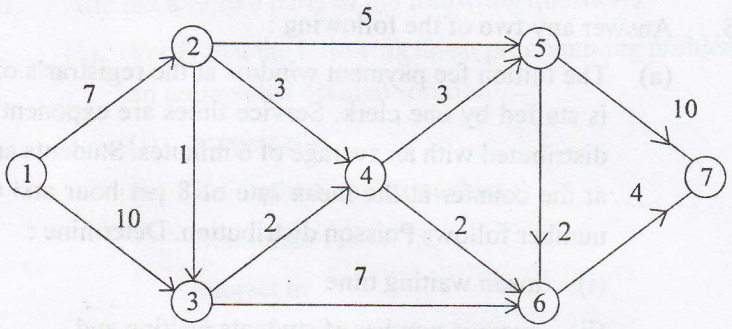
		Destinations			
		1	2	3	Supply
Sources	A	3	5	−2	3
	B	2	3	4	2
Requirement		1	2	2	

(c) Solve the following assignment problem as a transportation problem :

		Job			
		1	2	3	
Person	A	3	1	0	1
	B	2	7	2	1
	C	1	4	6	1
		1	1	1	

3. Answer any **two** of the following :

(a) Find the maximal flow from node 1 to node 7 in the following network :



(b) In the above network, find out the shortest distance from (1) to (7)

(c) What is the use of minimal cut typically in Network Flows Problem ? Explain with the help of an example.

OR

Discuss CPM and various floats.

4. Answer any **two** parts of the following :

(a) Develop the expression for EOQ and the corresponding optimal cost.

(b) What role maintenance have on machine's useful life ? What role do you see of maintenance cost, machine cost, etc. in deciding the life of an equipment and thus its replacement ?

(c) A furniture manufacturer makes 25 chairs of a certain model daily requiring 100 legs per day. A machine can produce 200 legs per day. Each setup costs Rs. 4,000. Annual holding cost per leg is Rs. 16·00. The manufacturer runs his business for 250 days in a year. Determine as to how many legs be produced in each production lot for an objective of minimizing total of holding and setup cost. For how many working days, a production run will go ?

5. Answer any **two** of the following :

(a) The tuition fee payment window at the registrar's office is staffed by one clerk. Service times are exponentially distributed with an average of 6 minutes. Students arrive at the counter at the mean rate of 8 per hour and their number follows Poisson distribution. Determine :

(i) mean waiting time

(ii) average number of students waiting and

(iii) Clerk's idle period fraction.

(b) Can we view inventory system as a queueing system ? Explain with the help of an example problem.

(c) Explain the concept of saddle point with reference to a rectangular problem. Discuss the graphical methodology for solving n×2 rectangular game problem.