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RR-0862

Third Year B. Sc. Examination

March / April – 2010

Operation Research

(CAN Course)

(New Course)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **T. Y. B. Sc.**

Name of the Subject :

☛ **Operation Research (New)**

☛ Subject Code No. : **0 8 6 2** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Answer **all** questions.

(3) First question carries **10** and other questions carry **12** marks each.

(4) Follow usual notations.

1 Answer the following :

(i) Define : Degenerate solution, Unbounded solution.

(ii) Write the dual of the following :

Max $Z = 6x_1 + 8x_2 - 10x_3$

s.t. $x_1 + 3x_2 - x_3 = 9,$

$x_1 + 4x_2 - 3x_3 = 8$

and $x_1, x_2, x_3 \geq 0$

(iii) Determine initial basic feasible solution of transportation problem by using NWCR :

		Destination				
		D_1	D_2	D_3	D_4	*Supply*
Source	S_1	9	3	5	1	7
	S_2	7	3	4	6	9
	S_3	4	8	7	2	18
	Demand	5	8	7	14	34

(iv) Solve the following assignment problem :

		Machines		
		A	*B*	*C*
Jobs	1	120	100	80
	2	80	90	110
	3	110	140	120

(v) Solve the following game :

	Player B				
Player A	3	−1	4	6	7
	−1	8	2	4	12
	16	8	6	14	12
	1	11	−4	2	1

2 (a) When do you say that the L.P.P. has an alternative optimal solution ? In such case how will you find it ?

Max $Z = 4x_1 + 10x_2$

s.t. $2x_1 + x_2 \leq 50$

$2x_1 + 5x_2 \leq 100$

$2x_1 + 3x_2 \leq 90$

and $x_1, x_2 \geq 0$

(b) Solve the following L.P.P.

Max $Z = 3x_1 + 2x_2$

s.t. $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

and $x_1, x_2 \geq 0$

OR

2 (a) Using Big-M method, solve the following L.P.P.

Max $Z = 3x_1 - x_2$

s.t. $2x_1 + x_2 \geq 2$

$x_1 + 3x_2 \leq 2$

$x_2 \leq 4$

and $x_1, x_2 \geq 0$

(b) Using two-phase method, solve the L.P.P.

Max $Z = 6x_1 + 4x_2$

s.t. $2x_1 + 3x_2 \leq 30$

$3x_1 + 2x_2 \leq 24$

$x_1 + x_2 \geq 3$

and $x_1, x_2 \geq 0$

3 (a) What do you mean by an infeasible solution ?

Max $Z = x_1 + 3x_2$

s.t. $x_1 - x_2 \geq 1$

$3x_1 - x_2 \leq -3$

and $x_1, x_2 \geq 0$

(b) Show that the following L.P.P. has an unbounded solution :

Max $Z = -2x_1 + 3x_2$

s.t. $x_1 \leq 5$

$2x_1 - 3x_2 \leq 6$

and $x_1, x_2 \geq 0$

OR

3 (a) A company operating 50 weeks in a year is concerned about its stocks of copper cable. This costs Rs. 240 a meter and there is a demand for 8000 meters a week. Each replenishment costs Rs. 1050 for administration and Rs. 1650 for delivery, while holding costs are estimated 25 per cent of value held a year. Assuming no shortages are allowed, what will be the optimal inventory policy for the company ?

(b) A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that when he starts a production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for a year is Rs. 2 and the set-up cost of a production run is rupees 180. How frequently should production run be made ?

4 (a) Solve the following transportation problem resolving degeneracy.

	A	B	C	Available
X	50	30	220	1
Y	90	50	170	3
Z	50	200	50	4
Required	3	3	2	

(b) Find an optimal solution of the following transportation problem :

	A	B	C	Supply
I	5	1	7	10
II	6	4	6	80
III	3	2	5	15
Demand	75	20	50	

OR

4 (a) Explain the following terms :

(i) Purchase cost

(ii) Lead time

(iii) Holding cost

(b) A product is sold at the rate of 50 pieces per day and is manufactured at a rate of 250 pieces per day. The set-up cost of the machines is Rs. 1000 and the storage cost is found to be Rs. 0.0015 per piece per day. With labour charges of Rs. 3.20 per piece, material cost at Rs. 2.10 per piece and overhead cost of Rs. 4.10 per piece, find the minimum cost batch size if the interest charges are 8 per cent (Assume 300 working days in a year). Compute the optimal number of cycles required in a year for the manufacture of this product.

5 (a) (i) What is meant by unbalanced assignment problem? What should be done to convert unbalanced assignment problem into balanced assignment problem ?

(ii) Solve the following assignment problem :

	I	II	III	IV	V
A	2	9	2	7	1
B	6	8	7	6	1
C	4	6	5	3	1
D	4	2	7	3	1
E	5	3	9	5	1

(b) A company has four machines on which to do five jobs. Each job can be assigned to one and only one machine. The cost of each job on such machine is given in the following table. Find the assignment to minimize the cost.

		Machines			
		1	2	3	4
Jobs	A	9	14	19	15
	B	7	17	20	19
	C	9	18	21	18
	D	10	12	18	19
	E	10	15	21	16

OR

5 (a) An automobile dealer wishes to put four repairmen to four different jobs. The repairmen have somewhat different kinds of skills and they exhibit different levels of efficiency from one job to another. The dealer has estimated the number of man-hours that would be required for each job-man combination. This is given in the following matrix. Find the optimal assignment that will result in minimum man-hours needed.

		Jobs			
		A	B	C	D
Men	1	5	3	2	8
	2	7	9	2	6
	3	6	4	5	7
	4	5	7	7	8

(b) Obtain an initial basic feasible solution to the following transporation problem using the least cost method.

		Destination				
		D_1	D_2	D_3	D_4	Supply
Source	S_1	1	2	1	4	30
	S_2	3	3	2	1	50
	S_3	4	2	5	9	20
	Demand	20	40	30	10	

6 (a) Explain the following terms :

(i) Zero sum game

(ii) Pure strategy

(iii) Fair game

(b) Using dominance property, find the optimal strategies and the value of the following game :

		Player B			
		I	II	III	
Player A	I	8	10	9	14
	II	10	11	8	12
	III	13	12	14	13

OR

6 (a) State the basic assumptions in a two-person zero-sum game.

(b) Solve the following game graphically.

		Player B	
		B_1	B_2
Player A	A_1	2	4
	A_2	2	3
	A_3	3	2
	A_4	–2	6