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RR-0883

Third Year B. Sc. Examination

March / April – 2010

Operation Research

(CAN Course)

[Old 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 (CAN) (Old)**

☛ Subject Code No. : **0 8 8 3** ☛ 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 :

(1) Define : Basic solution, Objective function.

(2) Write the dual of the following :

Max $Z = -5x_1 + 2x_2$

S.t. $-x_1 + x_2 \leq -3$

$2x_1 + 3x_2 \leq 5$

and $x_1, x_2 \geq 0$

(3) Determine initial basic feasible solution of transportation problem by using NWCR.

To

		D_1	D_2	D_3	D_4	a_i
	O_1	5	3	6	2	19
From	O_2	4	7	9	1	37
	O_3	3	4	7	5	34
	b_i	16	18	31	25	

(4) Solve the following assignment problem :

Machines

		A	B	C
	1	40	20	0
Jobs	2	0	10	30
	3	0	30	10

(5) Solve the following game.

Player B

$$\text{Player A} \begin{bmatrix} -5 & 2 \\ -7 & -4 \end{bmatrix}$$

2 (a) Use penalty method to solve the L.P.P. :

Min. $Z = 5x_1 + 3x_2$

s.t. $2x_1 + 4x_2 \leq 12$

$2x_1 + 2x_2 = 10$

$5x_1 + 2x_2 \geq 10$

and $x_1, x_2 \geq 0$.

(b) When do you say 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 $x_1, x_2 \geq 0$.

OR

2 (a) Using two-phase method, solve the following L.P.P. :

Min. $Z = x_1 + x_2$

s.t. $2x_1 + 4x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

and $x_1, x_2 \geq 0$.

(b) Using simplex method, 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 $x_1, x_2 \geq 0$.

3 (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

3 (a) What do you mean by an infeasible solution ? Show that the following L.P.P. has 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) Solve the following L.P.P. show that it has an unbounded solution :

Max $Z = -2x_1 + 3x_2$

s.t. $x_1 \leq 5$

$2x_1 - 3x_2 \leq 6$

and $x_1, x_2 \geq 0$.

4 (a) The production department for a company requires 3600 kg of raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs. 36 and the cost of carrying inventory is 25 per cent of the investment in the inventories. The price is Rs. 10 per kg. The purchase manager wishes to determine an ordering policy for raw material.

(b) A company operating 50 weeks in a year is concerned about its stockes of copper cable. This costs Rs. 240 a meter and there is a demand for 8,000 meters a week. Each replenishment costs Rs. 1,050 for administration and Rs. 1,650 for delivery, while holding costs are estimated 25 per cent of value held a year. Assuming no shortages are allowed, what is the optimal inventory policy for the company ?

OR

4 (a) Explain the following terms :

(i) Ordering cost

(ii) Holding cost

(iii) Stock out cost.

(b) A commodity is to be supplied at a constant rate of 200 units per day. Supplies of any amount can be obtained at any required time, but each ordering costs Rs. 50; cost of holding the commodity in inventory is Rs. 2 per unit per day while the delay in the supply of the item includes a penalty of Rs. 10 per unit per day. Find the optimal policy (Q, t), where t is the reorder cycle period and Q is the inventory after reorder. What would be the best policy, if the penalty cost becomes infinite ?

5 (a) Obtain an initial basic feasible solution to the following transportation problem using the least cost method.

Destination

Source	A	B	C	D	Supply
S_1	21	16	15	3	11
S_2	17	18	14	23	13
S_3	32	27	18	41	19
Demand	6	10	12	15	

(b) 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

OR

5 (a) A department head has four subordinates and four tasks to be performed. The subordinate differs in efficiency and the task differs in their intrinsic difficulty. His estimate of the times that each man would take to perform each task is given in the matrix.

		Tasks			
		I	II	III	IV
Subordinates	A	8	26	17	11
	B	13	28	4	26
	C	38	19	18	15
	D	19	26	24	10

How should tasks to be allocated so as to minimize the total man-hours ?

(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

6 (a) Explain the following terms :

(i) Two-person zero sum game

(ii) Pure strategy

(iii) Fair game.

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

OR

6 (a) Solve the following game graphically.

$$\text{Player A} \begin{matrix} A_1 \\ A_2 \\ A_3 \\ A_4 \end{matrix} \begin{matrix} \text{Player B} \\ B_1 \quad B_2 \end{matrix} \begin{bmatrix} 2 & 4 \\ 2 & 3 \\ 3 & 2 \\ -2 & 6 \end{bmatrix}$$

(b) Solve the following game :

$$\text{Player A} \begin{bmatrix} 2 & 4 & 3 & 8 & 4 \\ 5 & 6 & 3 & 7 & 8 \\ 6 & 7 & 9 & 8 & 7 \\ 4 & 2 & 8 & 4 & 3 \end{bmatrix} \quad \text{Player B}$$