Total No. of printed pages = 4

BA 172302

Roll No. of candidate | | | | | | | | | | |

4/12/2021

M.B.A. 3rd Semester End-Term Examination

Business Administration

OPERATION RESEARCH FOR INDUSTRY

(New Regulation and New Syllabus)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

The Question 1 is compulsory and answer any *four* from the rest of the questions.

1. Short questions : $(10 \times 1 = 10)$

   (a) Every LPP can have (two/more than two) variables.

   (b) If an LP constraint has less than equal to sign, it is made an equality by adding a (slack/surplus) variable.

   (c) In finding the dual of a maximization problem, the inequality signs of the constraints should be (greater than/less than) equal to.

   (d) In the simplex method of maximization, the optimality condition is, all $c_j - z_j$ values must(greater/less) than zero.

   (e) A transportation problem is said to be (degenerate/unbalanced) if the total supply from the origin does not match the total demand at the destination.

   (f) An assignment problem is said to be (unbalanced constrained) when each of the workers cannot do each of the given job.

   (g) If all entries of a cost matrix is increased by a constant, it (will/will not) affect the optimal solution.

   (h) If the value of a game is negative it signifies that the game is favourable towards (Player A/Player B)

   (i) If a single strategy is played by both the players it is called a (pure strategy/ zero sum) game.

   (j) Simulation can be used for optimization (True/False)

2. (a) Write the dual of (8)

Max $Z = 8x_1 + 10x_2 + 5x_3$

Subject to

$x_1 - x_3 \leq 4$

$2x_1 + 4x_2 \leq 12$

$x_1 + x_2 + x_3 \geq 2$

$3x_1 + 2x_2 - x_3 = 8$

$x_1, x_2, x_3 \geq 0$

(b) A retired person wants to invest up to Rs. 30,000 in fixed income securities. His broker suggests two bonds. Bond A and bond B has a yield of? percent and 10 percent respectively. He decides to invest, at most Rs. 12,000 in bond B and at least Rs. 6,000 in bond A. He wants the amount invested in Bond A to be at least equal to the amount invested in Bond B. What should the broker recommend if the investor wants to maximise his return on investment? Solve graphically. (7)

3. (a) A company makes two kinds of leather belts, A and B. Belt A is of high quality and belt B is of low quality and yields profits Rs. 4 and Rs. 3 respectively. The production of each belt of type of A requires twice as much time as a belt of type B, and if all belts were of type B, company could make 1000 belts a day. The supply of leather is sufficient for 800 belts per day, both A and B combined. Belt A requires a fancy buckle and only 400 of them are available per day, and for B its 700 buckles. What should be the daily production of each belt? Formulate an LPP and solve it using the Simplex Method. (9)

(b) What are the applications of Operations research? (6)

4. (a) Solve the following transportation problem for minimum transportation cost. (10)

Destination

Source	1	2	3	4	Supply
A	15	18	22	16	30
B	15	19	20	14	40
C	13	16	23	17	30
Demand	20	20	25	35	100

(b) "Assignment problems are a special case of transportation problem". Comment. (5)

5. (a) A company has four representatives (A, B, C and D) to be assigned to four areas. The monthly sale estimation (in thousands of rupees) of the representatives, area wise is given. Suggest the optimal assignment for maximum sales. (8)

Sales Representatives	Sale territory 1	2	3	4
A	200	150	170	220
B	160	120	150	140
C	190	195	190	200
D	180	175	160	190

(b) Determine the optimal strategies for A and B and find the value of the game. (7)

	B1	B2	B3	B4
A1	5	–4	5	8
A2	6	2	0	–5
A3	7	12	8	7
A4	2	8	–6	5

6. (a) A company maintains a stock of 30 geysers. The owner wants to keep a large inventory buy realises that it could be expensive to do so. He examines the geyser sales over the past 50 weeks and arrives at the following data :

Geyser sales per week	Number of weeks this number was sold
4	6
5	5
6	9
7	12
8	8
9	7
10	3
	50 (total)

Using random numbers simulate the demand simulate the demand for next 20 weeks, If the company maintained a constant supply of 8 water heaters, how many times it'll be out of stock? Also what is the average number of heaters demanded per week over the 20 week period?

Random numbers: 10, 24, 3, 32, 23, 59, 95, 34, 34, 51, 8, 48, 66, 97, 3, 96, 46, 74, 77, 44. (10)

(b) What is simulation? What are its advantages and disadvantages? (5)

7. Write short notes on (any *three*) : $(3 \times 5 = 15)$

(a) Degeneracy in transportation problem

(b) Saddle point

(c) Slack and surplus variable

(d) Economic interpretation of duality

(e) Pure and mixed strategies