USN | | | | | | | | | | 15CS653

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Operations Research

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define operations research. Explain the phases of operations research. **(07 Marks)**

b. A firm manufactures two types of products A and B and sells them at a profit of Rs.2 on type A and Rs.3 on type B. Each product is processed on two machines G and H. Type A requires one minute of processing time on G and two minutes of on H. Type B requires one minute of processing time on G and one minute on H. The machine G is available for not more than 6 hours 40 minutes while H is available for 10 hours during any working day. How many items of Type A and Type B should be produced so that the total profit is maximum? Formulate this problem as LPP. **(05 Marks)**

c. Using Graphical method solve the following :

Maximize $Z = 5x_1 + 4x_2$

Subject to $6x_1 + 4x_2 \le 24$

$x_1 + 2x_2 \le 6$

$-x_1 + x_2 \le 1$

$x_2 \le 2$

and $x_1, x_2 \ge 0$. **(04 Marks**

OR

2 a. Old hens can be bought at Rs.2 each and young ones at Rs. 5 each. The old hens lay 3 eggs per week and the young ones lay 5 eggs per week, each egg being worth 30 paise. A hen (young or old) costs Rs.1 per week to feed. You have only Rs.80 to spend for buying hens. How many of each kind should you buy to give a profit of more than Rs.6 per week assuming that you cannot house more than 20 hens? Formulate the problem as an LPP. **(06 Marks)**

b. Using graphical method solve the LPP :

Minimize $Z = 20x_1 + 10x_2$

Subject to $x_1 + 2x_2 \le 40$

$3x_1 + x_2 \ge 30$

$4x_1 + 3x_2 \le 60$

and $x_1, x_2 \ge 0$. **(06 Marks)**

c. Write the meaning of following terms with respect to a LPP :

i) Feasible solution ii) Infeasible solution iii) Optimal solution iv) Unsounded solution. **(04 Marks)**

Module-2

3 a. Explain the steps involved in setting up of a Simplex method. **(08 Marks)**

b. Solve the following LPP by using Big – M method

Maximize $Z = 4x_1 + 5x_2 - 3x_3 + 50$

Subject to $x_1 + x_2 + x_3 = 10$

$x_1 - x_2 \ge 1$

$2x_1 + 3x_2 + x_3 \le 40$

and $x_1, x_2, x_3 \ge 0$. **(08 Marks)**

OR

4 a. Using Simplex method, solve the following LPP

Maximize $Z = 4x_1 + 3x_2 + 6x_3$

Subject to $2x_1 + 3x_2 + 2x_3 \leq 440$

$4x_1 + 3x_3 \leq 470$

$2x_1 + 5x_2 \leq 430$

and $x_1, x_2, x_3 \geq 0$. **(08 Marks)**

b. Define basic solution and obtain all the basic solutions to the following system of linear equations :

Maximize $z = x_1 + 3x_2 + 3x_3$

Subject to $2x_1 + 3x_2 + 4x_3 = 10$

$3x_1 + 4x_2 + x_3 = 12$

Also classify the solutions into

i) Basic Feasible Solution

ii) Non–Degenerate Basic Feasible Solution

iii) Optimal Basic Feasible Solution. **(04 Marks)**

c. Write the procedure to solve LPP of two-phase Simplex method. **(04 Marks)**

Module-3

5 a. Use dual Simplex method to solve LPP,

Minimize $Z = 2x_1 + 2x_2 + 4x_3$

Subject to $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 \leq 3$

$x_1 + 4x_2 + 6x_3 \leq 5$

and $x_1, x_2, x_3 \geq 0$. **(08 Marks)**

b. Explain the following :

i) The essence of duality theory

ii) Primal dual relationship. **(08 Marks)**

OR

6 a. Write the procedure to solve LPP of dual Simplex method. **(08 Marks)**

b. Write the dual of the following LPP :

i) Maximize $Z = 3x_1 - x_2 + x_3$

subject to $4x_1 - x_2 \leq 8$

$8x_1 + x_2 + 3x_3 \geq 12$

$5x_1 - 6x_3 \leq 12$

and $x_1, x_2, x_3 \geq 0$

ii) Minimize $Z = 2x_2 + 8x_3$

subject to $3x_1 + x_2 \geq 12$

$2x_1 + x_2 + 6x_3 \leq 6$

$5x_1 - x_2 + 3x_3 = 4.$

and $x_1, x_2, x_3 \geq 0$. **(08 Marks)**

Module-4

7 a. Find the initial basic feasible solution to the following transportation problem using VAM.

15	10	17	18	2
16	13	12	13	6
12	17	20	11	7
3	3	4	5	

(08 Marks)

b. Find the optimal solution to the following assignment problem. (08 Marks)

Jobs

Machine	J_1	J_2	J_3	J_4	J_5
M_1	11	17	8	16	20
M_2	9	7	12	6	15
M_3	13	16	15	12	16
M_4	21	24	17	28	26
M_5	14	19	12	11	13

OR

8 a. Write the procedure of Hungarian method. (06 Marks)

b. There are 3 factories A, B and C. Supply goods to 4 dealers D_1, D_2, D_3 and D_4. The production capacities of these factories are 1000, 700, 900 respectively. The requirement from this dealers are 900, 800, 500 and 400 per month respectively. The per unit returns excluding transportation cost are Rs.8/-, 7/-, 9/- at the 3 factories. The following table gives the unit production cost from the factories to dealers. Determine the optimum solution to maximize the total returns.

	D_1	D_2	D_3	D_4	
A	2	2	2	4	1000
B	3	5	3	2	700
C	4	3	2	1	900
	900	800	500	400	

(10 Marks)

Module-5

9 a. Write short notes on : i) Simulated annealing algorithm i) Tabu search algorithm. (08 Marks)

b. Using dominance concept, obtain the optimal strategies for both the players and determine the value of game. The payoff matrix for the players is given below.

Player B

Player A				
	2	–2	4	1
	6	1	12	3
	–3	2	0	6
	2	–3	7	7

(08 Marks)

OR

10 a. Define the following with reference to game theory : i) Mixed strategy ii) Two person – zero – sum game iii) Pure strategy iv) Saddle point. (08 Marks)

b. Solve the following game graphically :

Player B

Player A				
	8	5	–7	9
	–6	6	4	–2

(08 Marks)

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