CBCS SCHEME

USN | | | | | | | | | | |

15CS653

Sixth Semester B.E. Degree Examination, June/July 2018
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. List and explain the various phases of an operations research study. **(06 Marks)**

b. An agriculturist has a farm with 126 acres. He produces Tomato, Mango and Potato. Whatever he raises is fully sold in the market. He gets Rs.5/- for Tomato/kg, Rs.4/- for Mango/kg and Rs.5/- for Potato/kg. The average yield is 1,500 kg of Tomato/acre, 1800 kg of Mango/acre and 1200kg of Potato/acre. To produce each 100kg of Tomato and Mango and to produce each 80kg of Potato a sum of Rs.12.50 has to be used for manure. Labour required for each acre to raise the crop is 6 man-days for Tomato and Potato each and 5 man-days for Mango. A total of 500 man-days of labour at a rate of Rs.40/- per man day are available. Formulate this as a LP model to maximize the agriculturist's total profit. **(10 Marks)**

OR

2 a. Define: i) Feasible region ii) Feasible solution iii) Optimal solution **(06 Marks)**

b. Solve the following LPP by graphical method,

Minimize $Z = 20x_1 + 10x_2$

Subject to $x_1 + 2x_2 \leq 40$

$3x_1 + x_2 \geq 30$

$4x_1 + 3x_2 \geq 60$

$x_1, x_2 \geq 0.$ **(10 Marks)**

Module-2

3 a. Define slack variable, surplus variable and basic solution. **(06 Marks)**

b. Solve the following LPP using simplex method.

$Z_{max} = 2x_1 + 2x_2 + 4x_3$

Subject to the constraint

$2x_1 + 3x_2 + x_3 \leq 240$

$x_1 + x_2 + 3x_3 \leq 300$

$x_1 + 3x_2 + x_3 \leq 300$

$x_1, x_2, x_3 \geq 0.$ **(10 Marks)**

OR

4 a. Solve the following LPP by two phase method

$Z_{max} = 3x_1 - x_2$

Subject to the constraint

$2x_1 + x_2 \geq 2$

$x_1 + 3x_2 \leq 2$

$x_2 \leq 4$

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

b. Solve the following LPP by Big-M method,
Maximize $Z = 2x_1 + 3x_2 + 10x_3$
Subject to $x_1 + 2x_3 = 0$
$x_2 + x_3 = 1$
$x_1, x_2, x_3 \geq 0$. **(08 Marks)**

Module-3

5 a. Explain the following:
i) The essence of duality theory.
ii) Primal dual relationship. **(06 Marks)**

b. Write the duals for the following LPP:
i) Maximize $Z = x_1 + 2x_2 + x_3$
Subject to the constraint $2x_1 + x_2 + x_3 \leq 2$
$-2x1 + x_2 - 5x_3 \geq -6$
$4x_1 + x_2 + x_3 \leq 6$
and $x_1, x_2, x_3 \geq 0$.
ii) Maximize $Z = 3x_1 + 5x_2 + 7x_3$
Subject to the constraint $x_1 + x_2 + 3x_3 \leq 10$
$4x_1 - x_2 + 2x_3 \geq 15$
and $x_1, x_2 \geq 0$ and x_3 is unrestricted variable. **(10 Marks)**

OR

6 a. Give the characteristics of dual problem. **(06 Marks)**

b. Solve the following LPP using dual simplex method
Minimize $Z = 2x_1 + x_2 + 3x_3$
Subject to $x_1 - 2x_2 + x_3 \geq 4$
$2x_1 + x_2 + x_3 \leq 8$
$x_1 - x_3 \geq 0$.
with all the variables non negative. **(10 Marks)**

Module-4

7 a. Find initial basic feasible solution by North-West corner method.

		Destination				
		D_1	D_2	D_3	D_4	Requirement
Factory	F_1	3	3	4	1	100
	F_2	4	2	4	2	125
	F_3	1	5	3	2	75
Demand		120	80	75	25	

(06 Marks)

b. Solve the following transportation problem and determine optimal distribution for the company so as to minimize the total transportation cost. Use VAM method to find the initial basic feasible solution. **(10 Marks)**

	Warehouses			
Factories	W_1	W_2	W_3	Available
F_1	16	20	12	200
F_2	14	8	18	160
F_3	26	24	16	90
Required	180	120	170	

OR

8 a. Explain various steps involved in Hungarian algorithm with example. **(06 Marks)**

b. Solve the following assignment problem. Assign 4 tasks to 4 persons so as to minimize the total cost. **(10 Marks)**

		Person			
		P_1	P_2	P_3	P_4
Tasks	T_1	42	35	28	21
	T_2	30	25	20	15
	T_3	30	25	20	15
	T_4	24	20	16	12

Module-5

9 a. Explain the following:

i) Minimax and Maximin principle.

ii) Pure and mixed strategies

iii) Two person zero sum game. **(06 Marks)**

b. Solve the following game using the concept of dominance. Write the strategies adopted by each player and find value of game. **(10 Marks)**

		B				
		I	II	III	IV	V
A	I	6	15	30	21	6
	II	3	3	6	6	4
	III	12	12	24	36	3

OR

10 a. Solve the following game by graphical method:

		B				
		I	II	III	IV	V
A	I	2	-1	5	-2	6
	II	-2	4	-3	1	0

(06 Marks)

b. Explain briefly: i) Genetic algorithm ii) Tabu search. **(10 Marks)**

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