CBCS SCHEME

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

Sixth Semester B.E. Degree Examination, Feb./Mar. 2022
Operation 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 operation research. Explain the phases of operation research. **(08 Marks)**

b. Define the following with reference to LPP
   i) Feasible solution
   ii) Slack variables
   iii) Degeneracy
   iv) Optimal solution. **(08 Marks)**

OR

2 a. A firm manufactures 3 types of products A, B, C. These products are processed on 3 different machines. The time required to manufacture each of 3 products and the daily capacity of the 3 machines are given in the table.

Machine	Product A	Product B	Product C	Availability of machines
1	2	3	2	440
2	4	–	3	470
3	2	5	–	430

It is required to determine the daily number of units to be manufactured for each products. The profit per unit of a product A, B, C is Rs. 4, 3, 6 respectively. It is assumed that all the amount produced are consumed in a market. Formulate the mathematical model for a given LP. **(08 Marks)**

b. Solve graphically for given LP
   Max $Z = 100x_1 + 40x_2$
   Subject to the constraints $5x_1 + 2x_2 \le 1000$
   $3x_1 + 2x_2 \le 900$
   $x_1 + 2x_2 \le 500$
   where $x_1, x_2 \ge 0$. **(08 Marks)**

Module-2

3 a. Find all the basic solutions to the following problem.
   Max $Z = x_1 + 3x_2 + 3x_3$
   Subject to the constraints $x_1 + 2x_2 + 3x_3 = 4$
   $2x_1 + 3x_2 + 5x_3 = 7$
   Also find which of the basic solution are
   i) Basic feasible
   ii) Non degenerative basic feasible
   iii) Optimal basic feasible. **(06 Marks)**

b. Solve the following LP by simplex method :
   Max $Z = 3x_1 + 4x_2$
   Subject to the constraints $x_1 + x_2 \le 450$
   $2x_1 + x_2 \le 600$
   Where $x_1, x_2 \ge 0$. **(10 Marks)**

OR

4 a. Solve the following LP by Big M – method :

$\text{Min } Z = 12x_1 + 20x_2$

Subject to the constraints $6x_1 + 8x_2 \geq 100$

$7x_1 + 12x_2 \geq 120$

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

b. Use 2-phse Simplex method to

$\text{Max } Z = 5x_1 - 4x_2 + 3x_3$

Subject to the constraints $2x_1 + x_2 - 6x_3 = 20$

$6x_1 + 5x_2 + 10x_3 \leq 76$

$8x_1 - 3x_2 + 6x_3 \leq 50$

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

Module-3

5 a. Explain the essence of duality theory. **(08 Marks)**

b. Write the dual of the following LPP

$\text{Minimize } Z = 3x_1 - 6x_2 + 4x_3$

Subject to the constraints $4x_1 + 3x_2 + 6x_3 \geq 9$

$1x_1 + 2x_2 + 3x_3 \geq 6$

$6x_1 - 2x_2 - 2x_3 \leq 10$

$x_1 - 2x_2 + 6x_3 \geq 4$

$2x_1 + 5x_2 - 3x_3 \geq 6$

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

OR

6 a. Write the working procedure of dual simplex method. **(06 Marks)**

b. Use the dual Simplex method to solve the following LPP

$\text{Minimize } Z = 2x_1 + 2x_2 + 4x_3$

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

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

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

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

Module-4

7 a. Find the initial basic feasible solution of the following transportation problem by

i) Least cost method

ii) North West corner rule method.

	A	B	C	D	Supply
	19	30	50	10	7
	70	30	40	60	9
	40	8	70	20	18
Demand	5	8	7	14	

(10 Marks)

b. Find the optimal transportation cost by Vogeis method.

	A	B	C	Supply
	2	7	4	5
	3	3	1	8
	5	4	7	7
	1	6	2	14
Demand	7	9	18	

(06 Marks)