CBCS SCHEME

USN | | | | | | | | | |

15CS653

Sixth Semester B.E. Degree Examination, Jan./Feb. 2023

Operations Research

Time: 3 hrs. Max. Marks: 80

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

VTU07-03-2023 09:00:19am - SN - SN - SN

Module-1

1 a. Define Operation Research. **(04 Marks)**

b. Discuss basic components of LP model. **(04 Marks)**

c. A computer company manufactures laptops and desktops that fetch total profit of Rs.700/- and 500/- per unit respectively. Each unit of laptop takes 4 hours of assembly time and 2 hours of testing time while each unit of desktop requires 3 hours of assembly time and 1 hour for testing. In a given month the total number of hours available for assembly is 210 hours and for inspection is 90 hours. Formulate the problem as LPP in such a way that the total profit is maximum. **(08 Marks)**

OR

2 a. Describe the steps involved in the formulation of LPP. **(04 Marks)**

b. Explain the terms : (i) Feasible solution (ii) unbounded solution **(04 Marks)**

c. A company produces two types of leather belts A and B and their profits are 40 and 30 rupees respectively. Each belt of type A requires twice as much a time as required for B. Company can produce 1000 belts per day. Leather is sufficient only for 800 belts per day. Belt A requires fancy buckles, there are only 400 buckles per day. For B only 700 buckles per day are available. How should the company manufacturers the 2 types of belts in order to maximize overall profit? Solve using graphical method. **(08 Marks)**

Module-2

3 a. Define with example : (i) Slack variable (ii) Surplus variable (iii) Basic feasible solution. **(06 Marks)**

b. Solve the following LPP using simplex method :

$Z_{max} = 3x_1 + 2x_2$

Subjected to $x_1 + x_2 \leq 40$

$x_1 - x_2 \leq 20$

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

OR

4 a. Solve the following LPP using Big M method :

Minimize $z = 2x_1 + 3x_2$

Subjected to constraints $x_1 + 2x_2 \leq 4$

$x_1 + x_2 = 3$ and

x_1 and $x_2 \geq 0$ **(10 Marks)**

b. Explain briefly two phase method. **(06 Marks)**

Module-3

5 a. Explain the procedure of dual simplex method. **(06 Marks)**

b. Use dual simplex method to solve the following LPP :

Minimize $z = 2x_1 + x_2 + 3x_3$

Subjected to $x_1 - 2x_2 + x_3 \geq 4$

$2x_1 + x_2 + x_3 \leq 8$ and $x_1 - x_3 \geq 0$ with all variables non negative. **(10 Marks)**

OR

6 a. Explain briefly : (i) Formulation of dual linear programming problem.
(ii) Unrestricted variables. **(06 Marks)**

b. The dual simplex method to solve the following problem :

Maximize $z = -2x_1 - 3x_2$

Subjected to $x_1 + x_2 \geq 2$

$2x_1 + x_2 \leq 10$

$x_1 + x_2 \leq 8$

with x_1 and x_2 non negative. **(10 Marks)**

Module-4

7 a. Explain North-West corner method with an example. **(06 Marks)**

b. Using Vogel's Approximation Method (VAM), solve the following transportation problem :

Demand

	D_1	D_2	D_3	
O_1	2	7	4	5
O_2	3	3	8	8
O_3	5	4	7	7
O_4	1	6	2	14
	8	8	18	

(10 Marks)

OR

8 a. Explain different types of assignment problems. **(06 Marks)**

b. Four new computers (C_1, C_2, C_3, C_4) are to be installed in a computer center. There are 5 vacant places (A, B, C, D and E) available. Because of limited space C_2 cannot be placed at C. and C_3 cannot be placed at A. The assignment cost of the computers to the places is given below. Find the optimal assignment.

	A	B	C	D	E
C_1	4	6	10	5	6
C_2	7	4	-	5	4
C_3	-	6	9	6	2
C_4	9	3	7	2	3

(10 Marks)

Module-5

9 a. Explain two person zero-sum game and non zero-sum game with example. **(06 Marks)**

b. Solve the following game whose pay off matrix is,

	Player B	
Player A	3	-2
	2	5

(10 Marks)

OR

10 a. List the applications of game theory. **(04 Marks)**

b. Explain min-max and max-min principle. **(04 Marks)**

c. Distinguish between pure strategy and mixed stratergy. **(04 Marks)**

d. Explain the concept of dominance. **(04 Marks)**

* * * * *