Progressive Education Society's
Modern College of Arts, Science & Commerce Ganeshkhind,
Pune – 16
Even Semester Examination: April 2023-2024
Faculty: Science and Technology

Program: BSc Comp05 **Semester: IV** **Set : B**
Program (Specific):B.Sc. Computer Science **Course Type: Core**
Class: S.Y.B.Sc(Comp. Sci.) **Max. Marks: 35**
Name of the Course: Operations Research **Course Code: 23-MTC-242**
Paper no.: II **Time: 2Hrs**

Instructions to the candidate:

1) ***There are 3 sections in the question paper. Write each section on separate page.***
2) ***All Sections are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Draw a well labelled diagram wherever necessary.***

SECTION: A

Q1) Solve any 5 of the following. **(10 Marks)**

a) Write the standard form of the following LPP
Maximize $Z = 5x + 3y$
Subject to;
$3x + 2y \leq 6$
$3x + y = 4,$
$x, y \geq 0.$

b) Convert the following assignment problem to a balanced assignment problem.

7	6	5	2
3	7	3	3
2	9	7	2

c) Solve the following transportation problem by North West Corner Method.

	D1	**D2**	**D3**	**Supply**
O1	13	15	16	17
O2	7	11	2	12
O3	19	20	9	16
Demand	14	8	23	

d) Explain the method to convert a unbalanced transportation problem to a balanced transportation problem.

e) Draw the feasible region for the following constraints.

$-x + y \geq 2$

$x - y \geq 2$,

$x, y \geq 0$.

f) Define i) Surplus Variable

ii) Feasible solution of a Linear programming problem.

g) Following is the optimal table of a LPP. Comment on the solution type.

CB	**XB**	**X**	**Y**	**S1**	**S2**	**S3**	**b**
6	X	1	1/2	½	0	0	4
0	S2	0	3/2	-3/2	1	0	6
0	S3	0	1	0	0	1	3
	Zj -Cj	0	0	3	0	0	

SECTION: B

Q.2) Solve any 3 of the following. (Marks 15)

a) Solve the following LPP graphically.

Maximize $Z = x + 2y$

Subject to;

$x + 2y \leq 20$

$x + y \leq 12$

$x \leq 10$

$x, y \geq 0$

b) Find the IBFS of the following Transportation Problem using Vogel's Approximation Method.

	D1	**D2**	**D3**	**D4**	**Supply**
O1	3	7	6	4	5
O2	2	4	3	2	2
O3	4	3	8	5	3
Demand	3	3	2	2	

c) Using simplex method , show that the following LPP has an unbounded solution.

Maximize $Z = 2x + 3y$

Subject to;

$-3x + y \leq 4$

$x - y \leq 2,$

$x, y \geq 0.$

d) Solve the assignment problem to minimize the cost.

Person → Job↓	**P1**	**P2**	**P3**	**P4**	**P5**
J1	3	8	2	10	3
J2	8	7	2	9	7
J3	6	4	2	7	5
J4	8	4	2	3	5
J5	9	10	6	9	10

e) Prove that dual of dual is primal for the following LPP.

Maximize $Z = 2x + 3y + z$

Subject to;

$$3x - y + 4z \leq 9$$
$$x + 3y - z \leq 2$$
$$x, y \geq 0$$

SECTION: C

Q.3) Solve any 1 of the following. **(Marks 10)**

a) Solve the following LPP using Big M method .

Minimize $Z = 8x_1 + 10\,x_2$

Subject to:

$$8x_1 + 6x_2 \geq 150$$
$$2x_1 + 9x_2 \geq 120\,,$$
$$x_1\,, x_2 \geq 0.$$

b) Find the IBFS of the following Transportation Problem using Matrix Minima Method. Hence find optimal solution using MODI method.

	D1	**D2**	**D3**	**Supply**
O1	5	3	12	60
O2	3	10	4	40
O3	3	5	1	40
Demand	30	65	45	

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