Assignment – Problems : Operations Research(MA30004)
Spring 2020 : Course Teacher: Prof. M. P. Biswal

No.1: Solve the following Transportation Problems:

Find the Phase-I solution by NWCR . Then obtain the Phase-II solution by MODI method.

(a)

To From	Destination				Amount Available
Source	3	7	6	4	50
	2	4	3	2	20
	4	3	8	5	30
Amount Required	30	30	20	20	-------

(b)

To From	Destination				Supply
Source	5	6	4	2	10
	2	10	1	3	20
	3	4	2	1	20
	2	1	3	2	10
Demand	20	10	10	20	

(c)

To From	Destination					Supply
Source	8	6	3	7	5	20
	5	9	8	4	7	30
	6	3	9	6	8	30
	0	0	0	0	0	20
Demand	25	25	20	10	20	

(d)

To From	Destination			Supply
Source	6	3	5	40
	4	8	7	30
	3	4	3	20
Demand	40	20	30	

(e)

To From	Destination					Supply
Source	2	4	6	5	7	40
	7	6	3	8	4	60
	8	7	5	2	5	60
	0	0	0	0	0	40
Demand	40	40	20	50	50	

(f)

To From	Destination				Amount Available
Source	2	3	4	9	20
	14	12	5	1	30
	12	15	9	3	50
Amount Required	10	10	20	50	-------

(g)

To From	Destination				Amount Available
Source	8	6	4	2	40
	10	6	6	2	30
	4	2	3	8	60
Amount Required	30	30	30	40	-------

(h)

To From	Destination				Supply
Source	5	6	7	8	130
	5	5	6	7	150
	4	7	6	7	150
	9	6	8	6	130
Demand	100	160	200	100	

No.2. Solve the following Assignment Problems by Hungarian Method.

(a)

	M1	M2	M3	M4
Job1	2	10	3	17
Job2	5	3	9	10
Job3	8	2	5	14
Job4	3	5	10	16

(b)

	M1	M2	M3	M4	M5
Job1	2	3	5	1	4
Job2	-1	1	3	6	2
Job3	-2	4	3	5	0
Job4	1	3	4	1	4
Job5	7	1	2	1	2

(c)

	M1	M2	M3	M4	M5
Job1	2	8	4	-1	3
Job2	1	5	4	4	8
Job3	0	2	5	1	5
Job4	4	1	3	2	5
Job5	6	2	5	2	5

(d)

	M1	M2	M3	M4
Job1	2	3	0	4
Job2	0	1	4	0
Job3	0	0	2	4
Job4	1	0	2	1

(e)

	M1	M2	M3	M4
Job1	50	55	42	57
Job2	66	70	60	68
Job3	40	42	38	45
Job4	81	78	72	80

No.3 Solve the following Two- person zero-sum game:

(a)

	B		
	10	-20	12
A	-20	40	-10
	10	-22	10

	B			
	-5	2	0	7
A	5	6	4	8
	4	0	2	-3

(b)   Solve the following 2x2 unstable game:

	B	
A	-5	10
	20	-5

	B	
A	-10	5
	5	-20

(c) Solve the following unstable matrix games by LP method:

	B		
	20	-30	40
A	-30	40	-50
	40	-50	60

	B		
	6	-6	12
A	-6	12	-10
	12	-10	18

(d) Solve the following   games by LP method:

	B	
	-2	5
	-5	3
A	0	-2
	-3	0
	1	-4

	B			
A	2	2	3	4
	4	3	2	2

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(e) Apply the method of Dominance to solve the following unstable games:

	B			
	3	2	4	0
A	3	4	2	4
	4	2	4	0
	0	4	0	8

(g)

	A			
	3	5	8	4
B	5	6	7	2
	4	3	9	8

(Hints: Take the transpose of the matrix)

(h)   Solve the following matrix game by any suitable method:
(i)

		B		
		1	-1	-1
	A	-1	2	-1
		-1	-1	3

	B			
	-1	-1	-1	2
A	-1	-1	2	-1
	-1	3	-1	-1
	4	-1	-1	-1

No.4 Solve the following IPP by Branch & Bound   method
or Cutting Plane method:

(a) $Max : Z = 4X_1 + 3X_2$

Subject to $2X_1 + X_2 \le 6$

$2X_1 + 3X_2 \le 9$

$X_1 , X_2 = 0,1,2,....$

(b)
$$Max : Z = 2X_1 + X_2$$

Subject to
$$2X_1 + 5X_2 \leq 17$$
$$3X_1 + 2X_2 \leq 10$$
$$X_1, X_2 = 0,1,2,....$$

(c)
$$Max : Z = 7X_1 + 9X_2$$

Subject to
$$-X_1 + 3X_2 \leq 6$$
$$7X_1 + X_2 \leq 35$$
$$X_1, X_2 = 0,1,2,....$$

(d)
$$Max : Z = 5X_1 + X_2$$

Subject to
$$-X_1 + 2X_2 \leq 4$$
$$X_1 - X_2 \leq 1$$
$$4X_1 + X_2 \leq 12$$
$$X_1, X_2 = 0,1,2,....$$

(e)
$$Max : Z = X_1 + X_2$$

Subject to
$$2X_1 + X_2 \leq 6$$
$$4X_1 + 5X_2 \leq 20$$
$$X_1, X_2 = 0,1,2,....$$

(f)
$$Min : Z = X_1 + X_2$$

Subject to
$$2X_1 + 2X_2 \geq 5$$
$$12X_1 + 5X_2 \leq 30$$
$$X_1, X_2 = 0,1,2,....$$

(g)
$$Min : Z = X_1 + 4X_2$$

Subject to
$$X_1 + 2X_2 \geq 6$$
$$2X_1 + X_2 \leq 8$$
$$X_1 \leq 3$$
$$X_1, X_2 = 0,1,2,....$$

Q5. Solve the following LPP by Primal /Dual simplex method:

(a)
$$Min : Z = 5X_1 + 2X_2 + 3X_3$$

Subject to
$$X_1 + 2X_2 - X_3 \geq 15$$
$$2X_1 + X_2 + X_3 \geq 12$$
$$X_1, X_2, X_3 \geq 0$$

(b)
$$Max: Z = 3X_1 + 6X_2$$

Subject to
$$X_1 + 2X_2 \geq 6$$
$$3X_1 + X_2 \geq 9$$
$$7X_1 + 5X_2 \leq 35$$
$$X_1, X_2 \geq 0$$

(c)
$$Max: Z = -X_1 - 4X_2 - 3X_3$$

Subject to
$$2X_1 + X_2 + 3X_3 \geq 4$$
$$X_1 + 2X_2 + 2X_3 \geq 3$$
$$X_1, X_2, X_3 \geq 0$$

(d)
$$Max: Z = 20X_1 + 24X_2$$

Subject to
$$2X_1 + X_2 \leq 24$$
$$2X_1 + 3X_2 \leq 48$$
$$X_1 + X_2 \leq 20$$
$$-2X_1 + 3X_2 \geq 0$$
$$X_1, X_2 \geq 0$$

(e)
$$Max: Z = X_1 - 4X_2 + X_3$$

Subject to
$$2X_1 + X_2 + 3X_3 = 10$$
$$-3X_2 + X_3 = -4$$
$$X_1 + X_3 = 3$$
$$X_1, X_2, X_3 \geq 0$$

No.6 Solve all the above LP problems (i) by Two-Phase simplex method
(ii) Big-M method.

No.7 Solve all the LP problems by Revised Simplex Method
by dropping the Integer restrictions.
*(**Submission of Assignment is Optional**)*