QP CODE: 22101061

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, APRIL 2022

Sixth Semester

Choice Based Core Course - MM6CBT01 - OPERATIONS RESEARCH

Common for B.Sc Mathematics Model I & B.Sc Mathematics Model II Computer Science

2017 Admission Onwards

E8173447

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. Define basic feasible solution to an LP problem. When it becomes non - degenerate.
2. What you mean by Redundant constraint in the graphical method of an LP problem?
3. Convert into standard form

   Maximize $Z = 10x_1 + 12x_2 + 8x_3$ subject to the constraints

   $3x_1 + x_2 + 2x_3 \leq 100,\ x_1 + 4x_2 \leq 120,\ 2x_1 + 3x_3 \leq 80,\ x_1, x_2, x_3 \geq 0.$
4. Define slack variable. Introduce slack variable in proper way for the constraint

   $5x - 6y + 3z \leq 12.$
5. What is the indicator of an alternative optimal solutions in LP problem?
6. *State unboundedness theorem.*
7. Name a method each to solve

   (i) The Transportation Problem and (ii) The Assignment Problem.
8. Name any two methods for solving an Assignment Problem.
9. Find an Initial Basic Feasible Solution by Least Cost Method.

	D1	D2	D3	D4	Supply
O1	6	4	1	5	14
O2	8	9	2	7	16
O3	4	3	6	2	5
Demand	6	10	15	4	

10. Find an optimal assignment to minimize cost:

Programmes

Programmers	A	B	C
1	2	6	2
2	1	4	1
3	5	3	8

11. Define pay off matrix with an example.

12. Use principle of dominance to reduce the size of the payoff matrix to 2 x 2 .

	Player B		
Player A	B_1	B_2	B_3
A_1	-5	10	20
A_2	5	-10	-10
A_3	5	-20	-20

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. An advertising agency wishes to reach two types of audiences- customers with annual income greater than one lakh rupees (target audience A) and customers with annual income of less than one lakh rupees (target audience B) . The total advertising budget is Rs. 200,000. One programme of TV advertising company costs Rs. 50,000. One programme of radio advertising costs Rs. 20,000. For contract reasons , at least three programmes ought to be on TV and the number of radio programmes must be limited to 5.Surveys indicate that a single TV programme reaches 4,50,000 prospective customers in targest audience A and 50,000 in target audience B. One radio programme reaches 20,000 prospective customers in target audience A and 80,000 in target audience B . Formulate this problem as an LP model to maximize total reach.

14. Use the Graphical method to solve the given LP problem.

Minimize $Z = 4x_1 + 3x_2$ subject to the constraints

$200x_1 + 100x_2 \geq 4000$, $x_1 + 2x_2 \geq 50$, $40x_1 + 40x_2 \geq 1400$, $x_1, x_2 \geq 0$

15. Use Big –M method and find first two tables to solve the following LP problem.

Minimize $Z = 5x + 3y$ subject to the constraints

$2x + 4y \leq 12$

$2x + 2y = 10$,

$5x + 2y \geq 10$, $x, y \geq 0$.

16. Solve the following LP problem

Maximize $Z = 3x + 9y$ subject to the constraints

$x + 4y \leq 8$

$x + 2y \leq 4$, $x, y \geq 0$.

17. *Write standard results on duality.*

18. *Write the dual of the following LP problem.*

Maximize $Z = x_1 - 2x_2 + 3x_3$ *subject to the constraints*

$-2x_1 + x_2 + 3x_3 = 2$,

$2x_1 + 3x_2 + 4x_3 = 1$, *and* $x_1, x_2, x_3 \geq 0$.

19. Find an Initial Basic Feasible Solution by Vogel's Approximation Method and test for optimality :

	D1	D2	D3	D4	Supply
O1	11	13	17	14	250
O2	16	18	14	10	300
O3	21	24	13	10	400
Demand	200	225	275	250	

20. Find an optimal assignment to minimize time taken:

		Book				
		I	II	III	IV	V
Typist	1	85	75	65	125	75
	2	90	78	66	132	78
	3	75	66	57	114	69
	4	80	72	60	120	72
	5	76	64	56	112	68

21. Solve the game by Graphical method

	Player B				
Player A	B_1	B_2	B_3	B_4	B_5
A_1	-5	5	0	-1	8
A_2	8	-4	-1	6	-5

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. Solve using Simplex method .

Maximize $Z = 16x + 17y + 10z$, Subject to the constraints

$x + y + 4z \leq 2000$

$2x + y + z \leq 3600$

$x + 2y + 2z \leq 2400$

$x \leq 30,$ $x, y, z \geq 0.$

23. Solve the following Transportation Problem to minimize cost and find an alternate solution if it exists.

	D1	D2	D3	Supply
O1	3	5	7	150
O2	6	4	10	200
O3	8	10	3	100
Demand	100	300	50	

24. Find an assignment schedule to minimize cost. Also find an alternate optimal solution, if it exists.

		Job			
		I	II	III	IV
Contractor	1	10	24	30	15
	2	16	22	28	12
	3	12	20	32	10
	4	9	26	34	16

25. Solve the game for two players A and B using linear programming method for which pay off matrix of A is given as

	Player B		
Player A	B_1	B_2	B_3
A_1	-1	2	1
A_2	1	-2	2
A_3	3	4	-3

(2×15=30)