TB246130T

Reg. No :.....

Name :.....

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2024

2021 ADMISSIONS REGULAR

SEMESTER VI - CHOICE BASED CORE (MATHEMATICS)

MT6B13AB18 - Operations Research

Time : 3 Hours **Maximum Marks : 80**

Part A

I. Answer any Ten questions. Each question carries 2 marks **(10x2=20)**

1. How can we conclude that an alternate optimum solution exist for the given LPP
2. Explain feasible solution of an L P problem
3. Define Slack Variable. Give an example
4. The standard weight of a special purpose brick is 5 kg and it contains two basic ingredients A and B . A costs Rs. 5 per kg and B costs Rs. 8 per kg. Strength considerations dictate that the brick should contain not more than 4 kg of A and a minimum of 2 kg of B. The demand for each product is likely to be related to the price of the brick. Formulate the problem as an LP model.
5. Define iso-profit line. How does this help us to obtain a solution to an LP problem
6. How many constraints and non-negative variables should be there for the dual of the primal maximization LP problem having m constraints and n non-negative variables
7. Explain how a profit maximization transportation problem can be converted into an equivalent cost minimization transportation problem.
8. Write the total number of basic variables in a feasible solution for a Transportation Problem with m origins and n destinations.
9. Define Triangular Basis
10. Determine an initial basic feasible solution of the following Transportation Problem using Least Cost method

	D1	D2	D3	Supply
O1	7	3	10	200
O2	4	8	2	100
O3	9	7	6	100
Demand	150	100	150	

11. Define the value of the game.
12. Define minimax principle.

Part B

II. Answer any Six questions. Each question carries 5 marks **(6x5=30)**

13. What conditions must exist in a simplex table to establish the existence of (a)an alternative solution (b) Unbounded Solution (c) No feasible solution
14. Show that the following system of linear equations has degenerate solution

    $2x_1+x_2-x_3=2$

    $3x_1+2x_2+x_3=3$
15. Solve graphically

    Min $Z = 3x_1+2x_2$

    subject to the constraints

$x_1-x_2 \leq 1$

$x_1+x_2 \geq 3, \quad x_1, x_2 \geq 0$

16. Solve the following LP problem

Maximize $Z = 3x_1+2x_2+x_3$

subject to the constraints

$2x_1+5x_2+x_3 = 12$

$3x_1+4x_2=11, \quad x_2, x_3 \geq 0$ and x_1 unrestricted in sign

17. Prove that if the i th constraint in the primal is an equality, then the i th dual variable is unrestricted in sign

18. Obtain the Dual of the following Primal LP problem

Minimize $Z = x_1-3x_2-2x_3$

subject to the constraints

$3x_1-x_2+2x_3 \leq 7$

$2x_1-4x_2 \geq 12$

$-4x_1+3x_2+8x_3=10, \quad x_1, x_2 \geq 0$; x_3 unrestricted in sign

19. State and prove the necessary and sufficient condition for the existence of a feasible solution to a Transportation Problem

20. Determine an initial basic feasible solution to the following Transportation problem using North-West corner rule

	D1	D2	D3	Supply
O1	2	7	4	5
O2	3	3	1	8
O3	5	4	7	7
O4	1	6	2	14
Demand	7	9	18	

21. Solve the game whose payoff matrix is given below

	Player B			
Player A	B1	B2	B3	B4
A1	3	2	4	0
A2	3	4	2	4
A3	4	2	4	0
A4	0	4	0	8

Part C

III. Answer any Two questions. Each question carries 15 marks **(2x15=30)**

22. Use two-phase method to solve the LP problem

Minimize $Z = x_1+x_2$

subject to the constraints

$2x_1+x_2 \geq 4$

$x_1+7x_2 \geq 7, \quad x_1 \geq 0, x_2 \geq 0$

23. The following table provides all the necessary information on the availability of supply to each warehouse, the requirement of each market, and the unit transportation cost(in Rs.) from each warehouse to each market

	M1	M2	M3	M4	Supply
W1	6	3	5	4	22

	M1	M2	M3	M4	Supply
W2	5	9	2	7	15
W3	5	7	8	6	8
Demand	7	12	17	9	

Determine the optimal schedule and minimum total transportation cost with initial solution obtained by Least Cost method.

24. An airline company has drawn up a new flight schedule that involves five flights. To assist in allocating five pilots to the flights, it has asked them to state their preference scores by giving each flight a number out of 10. The higher the number, the grater is the preference. A few of these flights are unsuitable to some pilots, owing to domestic reasons. These have been marked with X

Flight Number

	1	2	3	4	5
A	8	2	X	5	4
B	10	9	2	8	4
C	5	4	9	6	X
D	3	6	2	8	7
E	5	6	10	4	3

Determine the allocation of the pilots to flights in order to meet as many preferences as possible?

25. For the following payoff matrix, transform the zero-sum game into an equivalent linear programming problem and solve it by using the simplex method

	Player B		
Player A	B1	B2	B3
A1	1	-1	3
A2	3	5	-3
A3	6	2	-2