QP CODE: 23124540

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, MAY 2023

Second Semester

B.Sc Mathematics Model II Computer Science

Complementary Course - MM2CMT02 - MATHEMATICS - OPERATIONS RESEARCH - DUALITY, TRANSPORTATION AND ASSIGNMENT PROBLEM

2017 ADMISSION ONWARDS

D0DCBD35

Time: 3 Hours

Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. Define dual of an LPP
2. What is the relation between the optimum values of the objective functions of the primal and dual problems?
3. What is the advantage of dual simplex method?
4. Write some applications of linear programming.
5. What are the constraints of transportation problem?
6. Assume that there are 6 sources and 8 sinks in a transportation problem. What is the order of the transportation matrix?
7. In a basic solution of a transportation problem what is the maximum number of variables having non zero values?
8. Give an example of an unbalaced transportation problem.
9. Define loop in a transportation array.
10. If in a transportation problem one cost c_{ij} is missing what can we do to solve it?
11. What is an unbalanced assignment problem.
12. When we stop the transportation algorithm while solving a transportation problem?

(10×2=20)

Part B

*Answer any **six** questions.*

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

13. Find the dual of the LPP, Min $Z = x_1 + 2x_2 + 2x_3$ subject to $2x_1 + 4x_2 - 5x_3 \geq 7$, $3x_1 + 3x_2 + 6x_3 \leq 8$, $x_1 - x_2 + 3x_3 = 6$, $x_1, x_2, x_3 \geq 0$

14. Use dual simplex method to solve Max $z = -3x_1 - x_2$ subject to $x_1 + x_2 \geq 1$, $2x_1 + 3x_2 \geq 2$, x_1 , $x_2 \geq 0$.

15. Explain the term " transportation array".

16. With the help of an example explain the process " changing the basis " in a transportation problem.

17. Give an algorithm to solve a transportation problem.

18. Test whether the following six variables shown in the following table form a triangular set of equations,where m = 3 , n = 4.

x_{11}	x_{12}		x_{14}
x_{21}	x_{22}		
		x_{33}	

19. State the assignment problem.

20. Give an algorithm to solve an assignment problem.

21. 4 operators A,B,C and D are to be assigned to 4 machines M_1,M_2,M_3 and M_4 with the restriction that A and C can not work on M_3 and M_2 respectively. The assignment cost are given below. Find the minimum assignment cost.

	M_1	M_2	M_3	M_4
A	5	2	-	5
B	7	3	2	4
C	9	-	5	3
D	7	7	6	2

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Use dual simplex method to solve Min $z = x_1 + 3x_2 + 2x_3$ subject to $4x_1 - 5x_2 + 7x_3 \leq 8$, $2x_1 - 4x_2 + 2x_3 \geq 2$, $x_1 - 3x_2 + 2x_3 \leq 2$, x_1 , x_2 , $x_3 \geq 0$.

23. There are forest areas F_1, F_2, F_3, F_4 and timber depots D_1, D_2, D_3 . The following table is the resource of each forest area ,the minimum timber required at each depot to attract buyer and cost of transportation per unit of timber from each forest area to each depot. Find the distribution of entire forest resource for a minimum cost of transportation.

	D_1	D_2	D_3	
F_1	3	4	6	100
F_2	7	3	8	80
F_3	6	4	5	90
F_4	7	5	2	120
	110	110	60	

24. Solve the following T.P. for minimum cost with the cost coefficients , demands and supplies as given in following table. Also begin the solution procedure with the solution $x_{11} = 40, x_{12} = 28, x_{13} = 2, x_{24} = 38, x_{33} = 28, x_{34} = 4$.

	D_1	D_2	D_3	D_4	a_i
O_1	1	2	-2	3	70
O_2	2	4	0	1	38
O_3	1	2	-2	5	32
b_j	40	28	30	42	140

25. A group of friends six boys and six girls liked each other and decided to marry each other among themselves with the objective of maximize the total happiness of the group through monogamy. Each girl 'i' rates her preference for a boy 'j' as a_{ij} and each boy rates his preference for a girl as b_{ji} . The coefficient $c_{ij} = a_{ij} + b_{ji}$ is taken as a measure of the couple's happiness if married. With the following table for c_{ij} how should the partners be chosen?

		Girls					
Boys		1	2	3	4	5	6
	1	5	0	-6	8	7	-4
	2	-5	2	-3	0	6	-7
	3	3	-4	4	3	-5	2
	4	3	4	9	7	-2	3
	5	0	-1	-3	2	-1	2
	6	4	3	2	-1	0	4

(2×15=30)