19101727

QP CODE: 19101727

Reg No : .....

Name : .....

B.Sc. DEGREE (CBCS) EXAMINATION, MAY 2019

Second Semester

B.Sc Mathematics Model II Computer Science

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

2017 ADMISSION ONWARDS

1491CDEF

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

Part A

Answer any **ten** questions.

Each question carries **2** marks.

1. Write an LPP and its dual.
2. What is the relation between the optimum values of the objective functions of the primal and dual problems?
3. Find the dual of the LPP, Max $Z = 3x_1 - x_2 + x_3$ subject to $4x_1 - x_2 \leq 8$, $8x_1 + 2x_2 + 3x_3 \geq 12$, $5x_1 - 6x3 \leq 13$, $x_1, x_2, x_3 \geq 0$
4. Write the important steps in setting up the mathematical model.
5. What is the objective function of transportation problem?
6. Assume that there are 4 sources and 6 sinks in a transportation problem. What is the order of the transportation matrix?
7. If in a transportation problem total supply is less than total demand, what is the procedure to convert it into a balanced transportation problem?
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. Give an area of application of 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. Write the dual of the following LPP and verify that dual of the dual is primal. Min $Z = x_1 - 3x_2 - 2x_3$ subject to $2x_1 - 4x_2 \geq 12$, $3x_1 - x_2 + 2x_3 \leq 7$, $-4x_1 + 3x_2 + 8x_3 = 10$, $x_1, x_2, x_3 \geq 0$

14. Explain dual simplex algorithm.

15. Show that transportation problem is a special case of LPP.

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_{21}	x_{22}		
		x_{33}	x_{34}

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 $z = 5x_1 + 7x_2 + 6x_3 + 3x_4$ subject to $4x_1 + 6x_2 + 5x_3 - 3x_4 \geq 12$, $x_1 + 5x_2 + 2x_3 + x_4 \geq 8$, $-6x_1 + x_2 - 5x_4 \geq 8$, x_1 , x_2 , x_3 ,$x_4 \geq 0$.

23. Solve the following transportation problem for minimum cost starting with the degenerate solution $x_{12} = 30$, $x_{21} = 40$, $x_{32} = 20$, $x_{43} = 60$.

	D_1	D_2	D_3	a_i
O_1	4	5	2	30
O_2	4	1	3	40
O_3	3	6	2	20
O_4	2	3	7	60
b_j	40	50	60	150

24. Solve the following T.P. for minimum cost with the cost coefficients , demands and supplies as given in following table.

	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 batch of 4 jobs can be assigned to five different machines. The set up time for each job on each machine is given in the following table. Find optimal assignment of jobs to machines which minimizes the total set up time.

		Machines				
		M_1	M_2	M_3	M_4	M_5
Jobs	J_1	10	11	4	2	8
	J_2	7	11	10	14	12
	J_3	5	6	9	12	14
	J_4	13	15	11	10	7

(2×15=30)