39. Solve graphically

Maximize $z = 4x_1 + 5x_2$

Subject to $x_1 - 2x_2 \leq 2$

$2x_1 + x_2 \leq 6$

$x_1 + 2x_2 \leq 5$

$-x_1 + x_2 \leq 5$

$x_1 + x_2 \geq 1$

$x_1, x_2 \geq 0$

40. What is maximum flow algorithm ? Write the steps of the algorithm.

41. Solve using simplex method.

Minimize $z = 4x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 4$

$x_1, x_2 \geq 0$

42. Solve by using dual simplex method.

Minimize $z = 3x_1 + 2x_2 + x_3$

Subject to $3x_1 + x_2 + 2x_3 \geq 3$

$-3x_1 + 3x_2 + x_3 \geq 6$

$x_1 + x_2 + x_3 \leq 3$

$x_1, x_2, x_3 \geq 0$

K21U 0215

Reg. No. : .....

Name : .....

Sixth Semester B.Sc. Hon's (Mathematics) Degree (Reg./Supple./Improve.) Examination, April 2021
(2016 Admission Onwards)
BHM603 : OPERATIONS RESEARCH

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **any 4** questions out of 8 questions. **Each** question carries **1** mark. **(4×1=4)**

1. Define transportation model.
2. Define path and cycle in a network.
3. What are changes effecting feasibility of optimal solution of an LPP ?
4. What is PERT ?
5. Define unbounded solution of an LP problem.
6. What is degeneracy in LP problem ?
7. Define tree and a spanning tree in a network.
8. Write advantage of the dual problem.

SECTION – B

Answer **any 6** questions out of 12 questions. **Each** question carries **2** marks. **(6×2=12)**

9. Convert the following LP model in the equation form

Maximize $z = 2x_1 + 3x_2 + 5x_3$

Subject to $-6x_1 + 7x_2 - 9x_3 \geq 4$

$x_1 + x_2 + 4x_3 = 10$

$x_1, x_3 \geq 0$, x_2 is unrestricted

P.T.O.

10. Write the dual of the primal,
Maximize $z = 5x_1 + 12x_2 + 4x_3$
Subject to $x_1 + 2x_2 + x_3 \leq 10$
$2x_1 - x_2 + 3x_3 = 8$
$x_1, x_2, x_3 \geq 0$

11. Develop the first simplex table for the LP model using M method, after substituting artificial variables.
Minimize $z = 3x_1 + 6x_2$
Subject to $x_1 + 2x_2 \leq 5$
$6x_1 + 7x_2 \leq 3$
$4x_1 + 8x_2 \geq 5$
$x_1, x_2 \geq 0$

12. Explain Dijkstra's algorithm.

13. Write the steps in Hungarian method.

14. Draw the Network defined by, N = {1, 2, 3, 4, 5, 6}
A = {(1, 2), (1, 5), (2, 3), (2, 4), (3, 4), (3, 5), (4, 3), (4, 6), (5, 2), (5, 6)}.

15. Explain a general assignment model.

16. Solve graphically
Maximize $z = 2x_1 + 3x_2$
Subject to $x_1 + 3x_2 \leq 6$
$3x_1 + 2x_2 \leq 6$
$x_1, x_2 \geq 0$

17. What are the dual feasibility dual optimality condition in dual simplex algorithm ?

18. What are the rules for constructing the network ?

19. Explain steps in North-West Corner method.

20. Define cut and cut capacity in network.

SECTION – C

Answer **any 8** questions out of 16 questions. **Each** question carries **4** marks. **(8×4=32)**

21. Solve Graphically the following LP problem.
Maximize $z = 5x_1 + 4x_2$
Subject to $6x_1 + 4x_2 \leq 24$
$x_1 + x_2 \leq 6$
$-x_1 + x_2 \leq 1$
$x_2 \leq 2$
$x_1, x_2 \geq 0$

22. A shop manufactures three products whose unit profits are $ 2, $ 5 and $ 3 respectively. The company has budgeted 80 hours of labour time and 65 hours of machine time for the production of three products. The labour requirements per unit products 1, 2, and 3 are 2, 1 and 2 hours respectively. The corresponding machine time requirements per unit are 1, 1 and 2 hours. Formulate the problem as LP.

23. Determine algebraically all the basic solution of the problem and classify them as feasible and infeasible.
Maximize $z = x_1 + x_2$
Subject to $x_1 + 2x_2 \leq 6$
$2x_1 + x_2 \leq 16$
$x_1, x_2 \geq 0$

24. Consider the LP model
Maximize $z = 4x_1 + 14x_2$
Subject to $2x_1 + 7x_2 + x_3 = 21$
$7x_1 + 2x_2 + x_4 = 21$
$x_1, x_2, x_3, x_4 \geq 0$
Check optimality and feasibility of the basic variables (x_2, x_4), inverse.
$\begin{bmatrix} 1/7 & 0 \\ -2/7 & 1 \end{bmatrix}$

25. Using Vogel's approximation method solve

	1	2	3	4	Supply
1	10	2	20	11	15
2	12	7	9	20	25
3	4	14	16	18	10
Demand	5	15	15	15	