Reg. No…….. Name…… **18U646**

B.Sc. DEGREE END SEMESTER EXAMINATION MARCH 2018

SEMESTER **– 6: MATHEMATICS (CORE COURSE)**

COURSE: **15U6CRMAT13: OPERATIONS RESEARCH**

(Common for Regular - 2015 Admission & Supplementary - 2014 Admission)

Time: Three Hours Max. Marks: 75

SECTION A

Answer ***all*** questions

1. Write a basis for R^3.
2. Define convex set.
3. What is meant by basic feasible solution of a linear programming problem?
4. Define surplus variable.
5. Write the dual of the problem $\max f(x) = CX$, subjected to $AX \geq B, x \geq 0$.
6. What are the characteristic of a queuing system?
7. What are the customer behaviour's in a queuing system?
8. Define queue length
9. Convert the following transportation problem to a balanced transportation problem.

5	10	4	10
6	8	7	25
4	2	5	20
25	10	15	

10. Define degenerate solution of a transportation problem. (1 x 10 = 10)

SECTION B

Answer ***any Eight*** questions

11. Define vector space
12. Show that the intersection of 2 convex set is again a convex set.
13. Write the following L.P.P in the standard form

$$\min: \ x_1 + 3x_2$$

Subjected to

$$x_1 + x_2 \geq -3$$

$$-x_1 + x_2 \leq 2$$

$$x_1 - 2x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

14. Write the dual of the L.P.P

$$Max: z = 2x_1 + 3x_2$$

Subject to

$$3x_1 + 7x_2 \leq 21$$
$$x_1 - x_2 \leq 4$$
$$4x_1 + 5x_2 \leq 18$$
$$x_1, x_2 \geq 0$$

15. What are artificial variables? Write one example.

16. Describe the matrix form of transportation problem.

17. Write the mathematical model of an assignment problem.

18. Define pure birth process.

19. What do you mean by steady state and transient state?

20. What is meant by traffic intensity? (2 x 8 = 16)

SECTION C

Answer ***any Five*** questions

21. Use graphical method, solve the L.P.P

$$Max: z = 3x_1 + 2x_2$$

Subjected to

$$x_1 + x_2 \leq 4$$
$$x_1 - x_2 \leq 2$$
$$x_1, x_2 \geq 0$$

22. Show that the vertex of the set of feasible solutions S_F is a basic feasible solution

23. Show that dual of the dual is the primal.

24. Solve the transportation problem for minimum cost

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

25. Four operators A, B, C, D are to be assigned to 4 machines M_1, M_2, M_3, M_4 with the restriction that A and C cannot work on M_3 and M_2 respectively. The assignment cost is 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

26. State and prove Markovian property of inter arrival times
27. What is meant by queue disciple? Describe it with examples. (5 x 5 = 25)

SECTION D

Answer ***any Two*** questions

28. Solve using Simplex method

$Minimize: -5x_1 + 2x_2 - 3x_3$

Subjected to

$2x_1 + 2x_2 - x_3 \geq 2$

$3x_1 - 4x_2 \leq 3$

$x_2 + 3x_3 \leq 5$

$x_1, x_2, x_3 \geq 0$

29. Using simplex method

$Max: -4x_1 - 5x_2$

Subjected to

$2x_1 + x_2 \leq 6$

$x_1 + 2x_2 \leq 5$

$x_1 + x_2 \geq 1$

$x_1 + 4x_2 \geq 2$

$x_1, x_2 \geq 0$

30. Solve the Transportation Problem for minimum cost.

	D_1	D_2	D_3	
o_1	2	1	3	10
O_2	4	5	7	25
o_3	6	0	9	25
O_4	1	3	5	30
	20	20	15	

31. Explain the essential features of queuing system. (12 x 2 = 24)

****