TB146650A Reg. No…………………………

Name…………………………....

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017

SEMESTER VI - MATHEMATICS

MAT6OR - OPERATONS RESEARCH

Time: Three Hours **Maximum Marks: 80**

PART A

I. Answer all questions. Each question carries 1 mark.

1. Define basis of a vector space.
2. Define Euclidean norm of an n-dimensional vector space.
3. What is meant by a convex set?
4. What is a convex polyhedron?
5. Differentiate between slack and surplus variables.
6. When can we say that a transportation problem is balanced?
7. What is a triangular basis?
8. Define service utilisation factor of a queuing system.
9. Give examples of static queue disciplines.
10. Discuss various behaviour of arrivals in a queuing system

(10x1=10)

PART B

II. Answer any eight questions. Each question carries 2 marks

11. Is the set {[1,2,-1],[2,4,-2]} linearly independent? Justify your answer.
12. Give an example of a bounded set in R_2
13. Interpret the norm $\|X\| = |x_1| + |x_2|$ in E_2 geometrically.
14. Discuss Degeneracy in a linear programming problem.
15. Write the following LPP in standard form.
    $Min\ x_1 + x_2\ subject\ to\ 2x_1 + x_2 \geq 8,\quad 3x_1 + 7x_2 \geq 21,\quad x_1, x_2 \geq 0$
16. Write the dual of the following LPP.
    $Mi\ 6x_1 + 3x_2\ subject\ to\ 3x_1 + 4x_2 + x_3 \geq 5,\quad 6x_1 - 3x_2 + x_3 \geq 2,$
    $x_1, x_2, x_3 \geq 0$
17. Define a closed loop in a transportation array.
18. Obtain a basic feasible solution to the following transportation problem using north west corner rule.

	D1	D2	D3	D4	
S1	1	2	1	4	30
S2	3	3	2	1	30
S3	4	2	5	9	40

19. Define an assignment problem.
20. Define steady state and transient state of a queuing system
21. What are the essential features of a queuing system?
22. State Markovian property of inter arrival times.

(8x2=16)

PART C

III. Answer any six questions. Each question carries 4 marks.

23. Show that $w = \{X \text{ such that } X = (x_1, 0, x_2, x_3, \dots \dots, x_n)\}$ is a subspace of the vector space R_n
24. Show that if $|X + Y| = |X| + |Y|$, then either $Y = \lambda X$ or $X = 0$ or $Y = 0$
25. Show that if the set S_F of feasible solutions, if not empty, is a closed convex set bounded from below and so has at least one vertex
26. Show that dual of dual is the primal
27. Solve the following assignment problem

	1	2	3
A	120	100	80
B	80	90	110
C	110	140	120

28. Explain MODI method in a transportation problem.
29. Describe the matrix form of a transportation problem.
30. If the number of arrivals in a pure birth process follows poisson distribution, then find the probability distribution of inter arrival times.
31. In a queuing system, on an average 4 customers arrive after every minutes. Find

(i) P(no more than 2 minutes gap between successive arrivals)
(ii) Average time between successive aarivals
(iii) P(inter arrival times)

(6x4=24)

PART D

IV. Answer any two questions. Each question carries 15 marks

32. Solve the following LPP using simplex method.
$Maximize\ Z = 3x_1 + 5x_2 + 4x_3, subject\ to\ 2x_1 + 3x_2 \le 8, 2x_2 + 5x_3 \le 10, 3x_1 + 2x_2 + 4x_3 \le 15, x_1, x_2, x_3 \ge 0$
33. Use Big M Method to solve $Minimize\ Z = 5x_1 + 3x_2, subject\ to\ 2x_1 + 4x_2 \le 12, 2x_1 + 2x_2 = 10, 5x_1 + 2x_2 \ge 10, x_1, x_2 \ge 0$

34. Sole the following transportation problem for optimal solution.

	D1	D2	D3	D4	
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
	5	8	7	14	

35. Explain all queue disciplines ans service mechanisms of a queuing system.

(2x15=30)