Reg. No............................ Name.................................. U646

B Sc DEGREE END SEMESTER EXAMINATION MARCH 2017

SEMESTER – 6: MATHEMATICS (OPEN CORE)

COURSE: U6ORMAT13: OPERATIONS RESEARCH

(For Regular - 2014 Admission)

Time: Three Hours Max. Marks: 75

PART A

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

1. Is the set of vectors{[1,0,0], [0,1,0], [0,0,1]}a basis for R^3? Justify your answer.
2. Define a supporting hyper plane.
3. Give geometrical interpretation of Euclidean norm on R^2.
4. What are artificial variables?
5. Write the general form of a linear programming problem.
6. Discuss degeneracy in a transportation problem.
7. What is an assignment problem?
8. Define the term queue discipline.
9. Define steady state and transient state of a queuing system
10. Define a pure death process. Give an example.

(1 x 10 = 10)

PART B

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

11. Give an example of a hyper plane in R^2 and R^3.
12. Draw the convex hull of the set of points, {(1,2), (2,3),(3,1)}
13. State Cauchy – Schwartz Inequality
14. Write the dual of the following LPP.

$Min\, x_1 + x_2\ subject\ ¿\ 2x_1 + x_2 \geq 8,\ 3x_1 + 7x_2 \geq 21,\ x_1, x_2 \geq 0$

15. Discuss degeneracy in a Linear Programming Problem.
16. Define a triangular basis.
17. What is an assignment problem?
18. Discuss main Static queue disciplines.
19. Give any two relationship among the various performance measures of a queuing system.
20. State the main assumptions in a pure birth process.

(2 x 8 = 16)

PART C

Answer **any five** questions. Each question carries 5 marks.

21. Define convex linear combination of two points and *n* points.
22. Define δ – neighbourhood of an *n* dimensional vector in E^n. Draw the δ neighbourhood of point (1, 2) of E^2, where δ = 2.

23. 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.

24. Solve the following assignment problem:

	1	2	3	4	5
A	2	9	2	7	1
B	6	8	7	6	1
C	4	6	5	3	1
D	4	2	7	3	1
E	5	3	9	5	1

25. Explain North – West Corner rule to obtain initial basic feasible solution of a transportation problem.

26. State and prove Markovian property of inter arrival times.

27. Discuss different arrival behaviour of customers in a queuing system.

(5 x 5 = 25)

PART D

Answer **any two** questions. Each question carries 12 marks.

28. Solve the following LPP using simplex method.

$$Minimize\ Z = x_1 - 3x_2 + 2x_3,\ subject \text{¿} 3x_1 - x_2 + 2x_3 \leq 7, -2x_1 + 4x_2 \leq 12, -4x_1 + 3x_2 + 8x_3 \leq 10, x_1, x_2, x_3 \geq 0$$

29. Use Big M Method to solve $Maximize\ Z = 3x_1 - x_2,\ subject \text{¿} 2x_1 + x_2 \geq 2,$ $x_1 + 3x_2 \leq 2, x_2 \leq 4, x_1, x_2 \geq 0$

30. Solve 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	

31. Explain the main characteristics of a queuing system.

(12 x 2 = 24)

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