Register No:
Date:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE – 27

M.Sc BIG DATA ANALYTICS – I SEMESTER

SEMESTER EXAMINATION –OCTOBER 2018

BDA 1318: Linear Algebra & Linear Programming Problems

Time: 2 1/2 hrs. **Maximum marks: 70 marks**

Answer any Seven of the following

1. Define the following terms (2X5=10)
   a. Vector
   b. Scalar
   c. Matrix
   d. Eigen Value & Eigen Vector
   e. Determinant of Matrix
2. Find the Inverse of the following matrix (7 Marks)

$$A = \begin{pmatrix} 7 & 8 & 9 \\ 3 & 6 & 4 \\ 8 & 3 & 7 \end{pmatrix}$$

   When does a matrix Inverse value is zero? (3 Marks)

3. a) Solve the following system of linear equations (5 Marks)

$$3x - 4y + z = 6, \qquad x + 2z = 5, \qquad x + 5y - 7z = 8$$

   b) What is an idempotent matrix? Find if the matrix is idempotent matrix

$$A = \begin{pmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{pmatrix}$$

   (5 Marks)

4. State and prove the expression for Cramer's rule for a 3x3 matrix. (10 Marks)
5. Find the Eigen values and Eigen Vector of the following problem

$$A = \begin{pmatrix} 44 & 24 & 28 \\ 24 & 46 & 30 \\ 28 & 30 & 26 \end{pmatrix}$$

   (10 Marks)

6. A) Is this matrix a positive definite matrix? (5 Marks)

$$\begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$$

   B) What are the assumptions of the Linear Programming Problem? (5 Marks)

7. Write the difference between the following. (2+2+2+4)
   a. Optimal Solution and Feasible solution
   b. Minimization and Maximization

c. Degenerate solution and infinite solution
d. Simplex method and Two phase method

8. These products are produced using two machines, X and Y. Each unit of product 1 that is produced requires 15 minutes processing on machine X and 25 minutes processing on machine Y. Each unit of product 2 that is produced requires 7 minutes processing on machine X and 45 minutes processing on machine Y. The available time on machine X in week 5 is forecast to be 20 hours and on machine Y in week 5 is forecast to be 15 hours. Each unit of product 1 sold in week 5 gives a contribution to profit of £10 and each unit of product 2 sold in week 5 gives a contribution to profit of £4. It may not be possible to produce enough to meet your forecast demand for these products in week 5 and each unit of unsatisfied demand for product 1 costs £3, each unit of unsatisfied demand for product 2 costs £1.

   a. Formulate the problem of deciding how much of each product to make in week 5 as a linear program.
   b. Solve this linear program graphically. (10 Marks)

9. Solve the problem using Big M method (10 marks)

$$Maximise\ Z = x_1 + 5x_2$$

Subject to

$$3x_1 + 4x_2 \leq 6,\ \ x_1 + 3x_2\ \geq 2\ \ x1,\ \ x2 \geq 0$$