Register No:

Date:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE
I SEMESTER EXAMINATION, OCTOBER 2018
M.SC IN BIG DATA ANALYTICS
BDA 1318: LINEAR ALGEBRA AND LINEAR PROGRAMMING PROBLEM

TIME: 2 ½ HRS **MAX MARKS 70**

This Question Paper Contains Two Printed Pages and One Part

ANSWER SEVEN QUESTIONS **7 X10 = 70**

1.
   a. Define matrix with example
   b. If A+B = C find the unknown values. A, B & C are as follows

$$A_1 = \begin{pmatrix} 2 & 9 & 4 \\ 9 & 5 & 6 \\ 9 & 4 & x_1 \end{pmatrix} \quad B_1 = \begin{pmatrix} 10 & 1/9 & 0 \\ x_2 & 3/8 & 0 \\ 3 & 5/6 & 0 \end{pmatrix} \quad C_1 = \begin{pmatrix} 12 & x_3 & x_4 \\ x_5 & 5.38 & 6 \\ 12 & x_6 & 5 \end{pmatrix}$$

$$A_2 = \begin{pmatrix} 6 & 9 & 6 \\ 4 & 6 & 4 \\ 5 & 6 & 6 \end{pmatrix} \quad B_2 = \begin{pmatrix} y_1 & 7/9 & 0 \\ y_2 & 5/9 & 0 \\ 3/8 & y_3 & 0 \end{pmatrix} \quad C_2 = \begin{pmatrix} 5.5 & 8.13 & y_4 \\ 3.75 & 5.38 & y_5 \\ 4.635 & 5.38 & y_6 \end{pmatrix}$$

   Find C_1 X C_2 (2 + 8)

2.
   a. Solve the following linear system of equation

$$X + Y + Z = 1$$
$$uX + vY + wZ = a$$
$$u^2X + v^2Y + w^2Z = a^2$$

   b. If $A = \begin{pmatrix} a & 1 & 2 \\ 1 & a & 3 \\ 2 & 3 & a \end{pmatrix}$ and $|A^3| = 300763$. Find a real value of a (6 + 4)

3.
   a. Define following
      i. Inverse of Matrix
      ii. Trace of matrix
      iii. Determinant of matrix
      iv. Transpose of matrix
   b. What do you mean by Rank of a matrix? Explain the method to reduce a matrix to normal form (4 + 6)

4.
   a. What are row Echelon matrix and reduced row Echelon matrix? State whether the following matrix is row echelon matrix. Justify your answer $\begin{pmatrix} 1 & 5 & 8 \\ 0 & 1 & 7 \\ 0 & 2 & 3 \end{pmatrix}$
   b. Solve the following system:

$$2X_1 + 4X_2 - 2X_3 = 2$$
$$4X_1 + 9X_2 - 3X_3 = 8$$
$$-2X_1 - 3X_2 + 7X_3 = 10$$

   (5 + 5)

5.
   a. What is an orthogonal matrix? What are the properties? Check whether following matrix is an orthogonal matrix $\begin{pmatrix} 4 & -3 & 1 \\ 0 & 11 & -5 \\ 6 & 9 & 14 \end{pmatrix}$

b. Solve the following system of linear equation using Gauss Jordan Elimination method

$2X + 3Y - 3Z + W = 15$

$X - 2Y + 3Z - 2W = -3$

$3X + 5Y + Z - W = 20$

$4X + Y - Z + W = 5$ (4 + 6)

6.

a. Write a note on Eigen values and Eigen vectors

b. Write out the quadratic form which has matrix $\begin{pmatrix} 2 & 3 & 4 \\ 3 & 6 & 7 \\ 4 & 7 & 9 \end{pmatrix}$. Find the nature of quadratic form using Eigen values. (5 + 5)

7.

a. Define general linear programming problem along with mathematical representation. Explain the formulation of linear programming problem

b. Write a note on graphical method to solve Linear Programming Problem (6 + 4)

8.

a. What are slack variables and surplus variables? What is the importance of these? What is the role of artificial variable in LPP model?

b. Describe minimum ratio rule. (6+4)

9.

a. What are the different types of solution for an LPP? How to identify different kinds of solutions graphically? Explain

b. Indicate how to modify an LPP when a few variables are unrestricted.

c. Describe convex set (5 + 3 + 2)

10.

A manufacturer produces three types of plastic fixtures. The time (in hours) required for molding, trimming, and packaging is given in Table

Process	Type A	Type B	Type C	Total Time available
Molding	1	2	3/2	12000
Trimming	2/3	2/3	1	4600
Packaging	1/2	1/2	1/3	2400
Profit/unit	$11	$16	$15	

How many dozen of each type of fixture should be produced to obtain a maximum profit? (10)