Register No:

Date:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE – 27
M.Sc IN BIG DATA ANALYTICS – I SEMESTER
SEMESTER EXAMINATION –OCTOBER 2019
BDA 1318: Linear Algebra & Linear Programming Problems

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

Answer any Seven of the following

1. a) What do you mean by diagonal matrix? Give an example.
   b) When a square matrix is said to be singular? Is the matrix $\begin{bmatrix} 2 & 4 \\ 3 & 6 \end{bmatrix}$ singular?
   c) Define Eigen values and Eigen vectors
   d) Define Basic solution and Basic variables?
   e) For a Linear Programming problem define feasible solution and optimal solution

$2 \times 5 = 10$

2. a) Write down minors, cofactors and Adjoint of a square matrix a square matrix A=$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$
   b) Find the inverse of the square matrix $A = \begin{bmatrix} 2 & 4 & 1 \\ 5 & 2 & 6 \\ 1 & 5 & 3 \end{bmatrix}$

$4 + 6 = 10$

3. a) solve the following system of equations using matrix inverse method
   $2X_1 + 3X_2 = 12,\ 3X_1 + 2X_2 = 13$
   b) Using Gauss-Jordan Method solve the following system of equations
   $2X_1 + 3X_2 + 5X_3 = 23,\ 4X_1 + 6X_2 + 2X_3 = 22,\ \ X_1 + 2X_2 + 3X_3 = 14$

$4 + 6 = 10$

4. a) Define positive definite and positive semi definite matrices.
   b) Find the Eigen values and Eigen vector of $A = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}$

$4 + 6 = 10$

5. a) A firm is producing two types of items say type 1 and type 2. Each unit of type 1 item requires 5 units of raw material and 2 units of labour time. Each unit of type 2 item requires 3 units of raw material and 7 units of labour time. The total quantity of raw material available is 15 units. The labour time available is 14 hours. By selling one unit quantity of type 1 item the firm will get the profit worth Rs 12 and by selling one unit quantity of type 2 item the firm will get the profit worth Rs 13. Formulate the LPP so as to find the quantity of type 1 and type 2 items to be produced by the firm to maximize the profit satisfying the condition of availability of raw material and labour time.
   b) With reference LPP Define decision variables, Objective function, linear restrictions, and nonnegative restrictions

$6 + 4 = 10$

6. a) Obtain all possible basic solutions of the following system of equations and classify them on the basis of feasibility and degeneracy. $5X_1 + 2X_2 + 4X_3 = 20,\ 2X_1 + 8X_2 + 4X_3 = 24$
   b) Solve the following LPP graphically
   $Max\ Z = 12X_1 + 13X_2,$
   $3X_1 + 8X_2 \leq 24,$
   $9X_1 + 2X_2 \leq 18$
   $X_1 \geq 0, X_2 \geq 0$

$5 + 5 = 10$

7. a) What do you mean by slack and surplus variables?

b) Solve the following LPP by simplex method

$$Max\ Z = 12X_1 + 13X_2,$$
$$3X_1 + 8X_2 \le 24,$$
$$9X_1 + 2X_2 \le 18$$
$$X_1 \ge 0, X_2 \ge 0$$

$4 + 6 = 10$

8. Solve the following LPP by simplex method

$$Min\ Z = 10X_1 + 11X_2,$$
$$5X_1 + 2X_2 \ge 10,$$
$$2X_1 + 8X_2 \ge 16$$
$$X_1 \ge 0, X_2 \ge 0$$

$4 + 6 = 10$

9. a) Define unique solution, multiple solution, unbounded solution and infeasible solution of LPP.

b) How do you identify unique, multiple and unbounded solution in simplex table?

c) Convert the following LPP with unrestricted variable into an LPP with restricted variable.

$$Max\ Z = 14X_1 + 15X_2,$$
$$5X_1 + 2X_2 \le 10,$$
$$2X_1 + 8X_2 \le 16$$
$$X_1 \ge 0, X_2 is\ unrestricted$$

$4 + 3 + 3 = 10$