Roll No: | | | | | | | | | | |

B.E(FULL TIME)/ END SEMESTER EXAMINATIONS- NOV/DEC 2024

Computer Science and Engineering-RUSA

Semester-IV

MA6201 Linear Algebra

(Regulation 2018-RUSA)

Time: 3 Hours | Answer ALL Questions | Max.Marks:100

Part-A($10 \times 2 = 20$ Marks)

1) Show that $W = \{(a_1, a_2, a_3); a_1 = a_3 + 2\}$ is not a subspace of $V = R^3$.

2) Examine the linear dependence or independence of the following vectors $\{u_1 = (1, -1, 2), u_2 = (1, -2, 1), u_3 = (1, 1, 4)\} \in R^3$

3) Let $T : R^2 \to R^2$ is linear,$T(1, 0) = (1, 4)$ and $T(1, 1) = (2, 5)$ then, What is $T(2, 3)$?

4) Check whether the matrix $A = \begin{pmatrix} 5 & -3 \\ 3 & -1 \end{pmatrix}$ is Diagonalizable or not?

5) Define an inner product space.

6) Prove that $||x + y|| \leq ||x|| + ||y||$,where V is a inner product space over F and $x, y \in V$.

7) Compare Gauss elimination method and Gauss jordan method for solving the system $Ax = B$.

8) State the sufficient condition for convergence of Gauss-seidel method.

9) What is the use of Power method?

10) What are the singular values of a matrix A?

Part-B($8 \times 8 = 64$ Marks)
Answer any EIGHT questions

11) Show that $P_2(R)$,the set of all polynomials of degree less than or equal to 2 is a vector space over R with respect to usual addition of polynomials and usual scalar multiplication.

12) Determine the set $S = \{(1, 1, 0), (1, 0, 1), (0, 1, 1)\}$ is a basis for R^3 or not?

13) Let V and W be vector spaces, and let $T : V \to T$ be linear.If V is finite dimensional, then Prove that $nullity(T) + rank(T) = dim(V)$.

14) Let T be a linear operator on $P_2(R)$ defined by $T(f(x)) = f(x) + (x + 1)f'(x)$.Let B be a standard ordered basis for $P_2(R)$ then, Compute The Characteristic polynomial and Eigen value of T.

15) Let T be a linear operator on $P_2(R)$ defined by $T(f(x)) = f(1) + f'(0)x + (f'(0) + f''(0))x^2$. Test T for Diagonalizability.

16) Apply the Gram-Schmidt Orthogonalization process to obtain an Orthonormal basis for the subspace R^3 generated by $S = \{(1, 0, 1), (0, 1, 1), (1, 3, 3)\}$ with respect to the standard inner product.

17) Fit a least square line for $(1,2),(2,3),(3,5),(4,7)$ and hence find the error.

18) Solve the system of equations $x+y+z=1, 4x+3y-z=6, 3x+5y+3z=4$ using LU decomposition method.

19) Using Gauss elimination method solve $x+2y+z=3, 2x+3y+3z=10, 3x-y+2z=13$.

20) Apply SOR method to solve the system of equations $3x-y+z=1, 3x+6y+2z=0, 3x+3y+7z=4$.

21) Determine the Numerically largest eigen value and corresponding eigen vector for $A=\begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$ by taking $X_0=(1\ 0\ 0)^T$ as initial vector.

22) Construct a Singular value decomposition for the matrix $A=\begin{pmatrix} 3 & -1 \\ 1 & 3 \\ 1 & 1 \end{pmatrix}$

Part-C($2 \times 8 = 16$ Marks)

23) Find the QR decomposition for the matrix $A=\begin{pmatrix} 1 & 2 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{pmatrix}$

24) Solve the following system of equations by Gauss-Seidel method.

$$\begin{aligned} 8x-3y+2z&=20 \\ 4x+11y-z&=33 \\ 6x+3y+12z&=35. \end{aligned}$$