R20 Regulation *Subject code:* **3B1AA**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech I Semester Regular/Supplementary Examinations, April 2022

LINEAR ALGEBRA, CALCULUS & PARTIAL DIFFERENTIAL EQUATIONS
(CIVIL ENGINEERING)

Maximum Marks: 70 Date:30.04.2022 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 Define symmetric matrix and give an example.

2 Write the working rule for Gauss's Elimination method.

3 Obtain the matrix of the quadratic form $2x^2 + 8z^2 + 4xy + 10xz - 2yz$.

4 The product of two eigen values of the matrix $A = \begin{pmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$ is 32. Find the third Eigen value.

5 State the Rolle's theorem.

6 State the mean value theorem.

7 If $x = u(1+v),\ y = v(1+u)$, find $\frac{\partial(x,y)}{\partial(u,v)}$.

8 Find the stationary points of $f(x,y) = 3x^2 - y^2 + x^3$.

9 Obtain partial differential equation by eliminating arbitrary constants a and b from $(x-a)^2 + (y-b)^2 + z^2 = 1$.

10 Solve $\sqrt{p} + \sqrt{q} = 1$.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 Solve by Gauss elimination method for the following system of equations $2x + y - z = 8, -3x - y + 2z = -11, -2x + y + 2z = -3$. [10]

OR

12 Find the inverse of the matrix $\begin{pmatrix} 3 & 0 & 2 \\ 2 & 0 & -2 \\ 0 & 1 & 1 \end{pmatrix}$ by Gauss-Jordan method. [10]

13 Reduce the quadratic form $8x_1^2 + 7x_2^2 + 3x_3^2 - 12x_1x_2 - 8x_2x_3 + 4x_3x_1$ to the canonical form through an orthogonal transformation. [10]

OR

14 Verify Cayley- Hamilton theorem for the matrix $A = \begin{pmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$ and hence find A^4. [10]

15 Evaluate the improper integral $\int_{-\infty}^{\infty} xe^{-x^2} dx$, if it exists. [10]

OR

16 Verify Lagrangep mean value theorem for the function f(x) = $x^2 - 4x - 3$ in the interval [1, 4]. [10]

17 Obtain the volume of the largest rectangular parallelepiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$. [10]

OR

18 If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$, $z = \frac{xy}{z}$, then find $\frac{\partial(u,v,z)}{\partial(x,y,z)}$. [10]

19 Solve $x^2 (y - z) p + y^2 (z - x) q = z^2 (x - y)$. [10]

OR

20 Form the partial differential equation by eliminating the arbitrary functions 'f' and 'g' from $z = f(x^3 + 2y) + g(x^3 - 2y)$. [10]