R20 Regulation *Subject code:* **3B1AF**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)

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

LINEAR ALGEBRA & APPLIED CALCULUS

(Common to EEE & ME)

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 Identity matrix.

2 Compare Gaussian elimination and Gauss-Jordan methods in solving the linear system $AX = B$.

3 Find the characteristic equation of the matrix $A = \begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix}$.

4 If 1 and 2 are the eigen values of a 2×2 matrix A, determine the eigen values of A^2 and A^{-1}.

5 Evaluate $\int_0^{\frac{\pi}{2}} \int_0^{\sin\theta} r dr d\theta$

6 Evaluate $\iint dxdy$ over the region bounded by $x = 0, x = 2, y = 0, y = 2$.

7 Define Beta and Gamma functions.

8 State Rolle's theorem.

9 Form partial differential equation by eliminating the arbitrary function from z = f(xy).

10 If $x = r\cos\theta$ and $y = r\sin\theta$, find $\frac{\partial(x,y)}{\partial(r,\theta)}$.

Part-B

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

11 Using Gauss-Jordan method, find the inverse of the matrix $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{pmatrix}$ [10]

OR

12 Solve the given system of equations by Gaussian elimination method:
$x - y + z = 8\,; 2x + 3y - z = -2\,; 3x - 2y - 9z = 9$. [10]

13 Reduce the quadratic form $6x^2 + 3y^2 + 3z^2 - 4xy - 2yz + 4zx$ into a canonical form by an orthogonal transformation. [10]

OR

14 Using Cayley-Hamilton theorem evaluate the matrix,
$A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 - 8A^2 + 2A - I$, if $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ [10]

15 Find the area enclosed by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$. [10]

OR

16 Find the area of the circle using double integral. [10]

17 Let $f(x) = x^2 + 8x + 14$. Find all values of 'c' in the interval (-6,-2) using Rolle's theorem. [10]

OR

18 Check the validity of Cauchy's mean value theorem for the functions $f(x) = sinx$ and $g(x) = cosx$ in the interval $\left(0, \frac{\pi}{2}\right)$. [10]

19 Examine $f(x,y) = x^3 + y^3 - 12x - 3y + 20$for its extreme values. [10]

OR

20 Evaluate the area of the tetrahedron bounded by the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$. [10]