R20 Regulation *Subject code:3B1AF*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, April 2023

LINEAR ALGEBRA & APPLIED CALCULUS

(Common to EEE and ME)

Maximum Marks: 70 Date:04.04.2023 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 orthogonal matrix.

2 Show that the system of linear equations $4x + 2y = 7$, $2x + y = 6$ has no solution.

3 If 'λ' is an Eigen value of the matrix A then 'λ' is also an Eigen value of A^T.

4 Find the nature of the Quadratic form $Q = x^2 + 2y^2 + 2z^2 - 2xy + 2xz - 2yz$.

5 Evaluate $\int_0^{\pi/2}\int_0^{\pi/2} \sin(x+y)\,dxdy$.

6 Define surface integral.

7 Show that $\beta(m,n) = \beta(n,m)$.

8 Find $\Gamma\frac{7}{2}$.

9 If $u=e^x$, find $\frac{\partial^2 u}{\partial y \partial x}$.

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

Part-B

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

11 Define Echelon form of a matrix and Find the rank of the matrix by reducing to Echelon form where $A = \begin{bmatrix} 4 & 2 & 3 \\ 8 & 4 & 6 \\ -2 & -1 & -1 \end{bmatrix}$. [10M]1

OR

12 Show that the only real number λ for which the system $x + 2y + 3z = \lambda x$; $3x + y + 2z = \lambda y$; $2x + 3y + z = \lambda z$ has non-zero solution is 6 and solve them when $\lambda = 6$. [10M]

13 Determine the Eigen values and Eigen vectors of the following matrices. [10M]

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}.$$

OR

14 Reduce the following quadratic form to canonical form by orthogonal transformation $3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2xz$. [10M]

15 Find the area of the region bounded by $y^2 = 4ax$ and $x^2 = 4ay$ [10M]

OR

16 Change the order of integration and evaluate $\int_o^a \int_{x^2/4a}^{2\sqrt{ax}} xy\, dy\, dx$. [10M]

17 Verify Rolle's mean value theorem for the function $f(x) = log\frac{x^2+ab}{x(a+b)}$ in[a,b];a>0,b>0. [10M]

OR

18 S.T $\beta(m,n) = \int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}} dx = \int_0^\infty \frac{x^{n-1}}{(1+x)^{m+n}} dx$. [10M]

19 If $x = e^r sec\theta$, $y = e^r tan\theta$ then prove that $JJ^I = 1$ [10M]

OR

20 Find the extreme values $u(x,y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$. [10M]