R20 Regulation *Subject code: 3B1AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, June 2024

LINEAR ALGEBRA, CALCULUS & PARTIAL DIFFERENTIAL EQUATION

(Civil Engineering)

Maximum Marks: 70 Date:25.06.2024 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)		CO	Bloom Tx
1	Find the rank of the matrix A= $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$.	1	L1
2	Show that the system of linear equations $4x + 2y = 7$, $2x + y = 6$ has no solution.	1	L1
3	If 'λ' is an Eigen value of the matrix A then 'λ' is also an Eigen value of A^T.	2	L1
4	Determine the nature, index, and signature of the quadratic form $x^2 - 6xy + y^2$.	2	L1
5	State Rolle's mean value theorem.	3	L1
6	Find $\Gamma -\frac{7}{2}$	3	L1
7	Find the degree of the homogeneous functions $Z = \frac{\sqrt{x}+\sqrt{y}}{x+y}$	4	L1
8	If $x = r\cos\theta$, $y = r\sin\theta$ then find $\frac{\partial(r,\theta)}{\partial(x,y)}$.	4	L1
9	Form a partial differential equation for the equation $(x-a)(y-b) - z^2 = x^2 + y^2$	5	L1
10	solve $\frac{\partial^2 z}{\partial x \partial y} = \cos x \cos y$	5	L1

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	L2
	OR		
12	Investigate for what values of k the equations $x + y + z = 1$; $2x + y + 4z = k$; $4x + y + 10z = k^2$ have infinite number of solutions. (10M)	1	L2

13	Determine the Eigen values and Eigen vectors of the following matrices; $A = \begin{bmatrix} 1 & 1 & 1 \\ -1 & -3 & -3 \\ 2 & 4 & 4 \end{bmatrix}$. (10M)	2	L2
	OR		
14	Reduce the quadratic form to canonical form by an orthogonal reduction and find the Nature, index, sign $2x^2 + 2y^2 + 2z^2 - 2xy + 2xz - 2yz$. (10M)	2	L2
15	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)	3	L2
	OR		
16	Show that $\beta(m,n) = \int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}}dx = \int_0^\infty \frac{x^{n-1}}{(1+x)^{m+n}}dx$ (10M)	3	L2
17	If $u = xy + yz + zx$, $v = x^2 + y^2 + z^2$, $w = x + y + z$ then show that the functions are functionally dependent and hence find the relation between them. (10M)	4	L2
	OR		
18	Find the extreme values $u(x,y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$. (10M)	4	L2
19	Solve xp + yq = 3z. (10M)	5	L2
	OR		
20	Solve $(x^2 + y^2)(p^2 + q^2) = 1$. (10M)	5	L2