R20 Regulation *Subject code:* 3B1AA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Regular Examinations, July 2021

LINEAR ALGEBRA, CALCULUS & PARTIAL DIFFERENTIAL EQUATIONS

(CIVIL ENGINEERING)

Maximum Marks: 70 Date:12.07.2021 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 rank of the matrix.

2 Find the inverse of the matrix $A = \begin{pmatrix} 5 & -2 \\ 3 & 4 \end{pmatrix}$ by Gauss-Jordan method.

3 State Cayley-Hamilton theorem.

4 Two of the eigen values of $A = \begin{pmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$ are 2 and 8. Find the eigen values of A^{-1}.

5 State the Rolle's theorem.

6 State the Lagrangs mean value theorem.

7 Find the Jacobian $\frac{\partial(x,y)}{\partial(r,\theta)}$ if $x = r\cos\theta$, $y = r\sin\theta$.

8 Define saddle point.

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

10 Find the complete solution of the partial differential equation $P + q = 1$.

Part-B

Answer All the following questions. (10M X 5=50Marks)

11 Solve by Gauss elimination method for the following system of equations $10x - 2y + 3z = 23, 2x + 10y - 5z = -33$ and $3x - 4y + 10z = 41$. (10M)

OR

12 Find the inverse of the matrix $\begin{pmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{pmatrix}$ by Gauss-Jordan method. (10M)

13 Reduce $6x^2 + 3y^2 + 3z^2 - 4xy - 2yz + 4xz$ into a canonical form by an orthogonal reduction. (10M)

OR

14 Verify Cayley- Hamilton theorem for the matrix A = $\begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$ and hence find A^{-1}. (10M)

15 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)

OR

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

17 A rectangular box open the top is to have volume of 32 cubic meters. Find the dimensions of the box requiring least material for its construction. (10M)

OR

18 Find the maximum and minimum values of $x^3 + y^3 - 12x - 3y + 20$. (10M)

19 Solve $x(y-z)p + y(z-x)q = z(x-y)$ (10M)

OR

20 Form the partial differential equation by eliminating the arbitrary functions f and g in $z = x^2 f(y) + y^2 g(x)$ (10M)