R18 Regulation *Subject code:2B1AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, April 2023

Mathematics-I

(Common to CE,EEE,ME,ECE,CSE & IT)

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 If A,B are invertible matrices of the same order then prove that $(AB)^{-1} = B^{-1} A^{-1}$

2 Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 8 & 7 & 0 & 5 \end{bmatrix}$

3 Find the eigen values of the matrix $\begin{bmatrix} 4 & 1-3i \\ 1+3i & 7 \end{bmatrix}$

4 Obtain a quadratic form corresponding to the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 0 & 3 \\ 3 & 3 & 1 \end{bmatrix}$

5 State the theorem on Auxiliary series.

6 Test the series for convergence $\sum_{n=1}^{\infty} \frac{1}{n^2+1}$

7 Find the stationary points of the function $2x^2 + 2xy - y^3$

8 Define chain rule of partial differentiation.

9 Find the limits by change the order of integration $\int_0^a \int_{x/a}^{\sqrt{x/a}} (x^2 + y^2) dx\, dy$

10 Evaluate $\int_0^4 \int_0^x xe^{2y} dx\, dy$

Part-B

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

11 Solve $2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$ by Gauss elimination method. [10M]

OR

12 Find an LU decomposition of the matrix A and solve the linear system AX=B [10M]

$$\begin{bmatrix} -3 & 12 & -6 \\ 1 & -2 & 2 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -33 \\ 7 \\ -1 \end{bmatrix}$$

13 Reduce the quadratic form to canonical form by an orthogonal reduction and find the Nature, index, signature $2x^2 + 2y^2 + 2z^2 - 2xy + 2xz - xyz$ [10M]

OR

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

15 Discuss the nature of the series $\sum \frac{3.6.9....3n.}{4.7.10....(3n+1)} \cdot \frac{5^n}{(3n+2)}$ [10M]

OR

16 Find the nature of the series $\frac{a+x}{1!} + \frac{(a+2x)^2}{2!} + \frac{(a+3x)^3}{3!} + \ldots\ldots\ldots$by Logarithmic test. [10M]

17 Find the extreme values of the function sin x. sin y . sin (x+y). [10M]

OR

18 Find the volume of the greatest rectangular parallellopiped that can be inscribed in the ellipsoid. [10M]

19 Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz.dy.dx$ [10M]

OR

20 Evaluate $\iiint \frac{dxdydz}{\sqrt{1-x^2-y^2-z^2}}$ by changing to spherical polar coordinates over the volume of the sphere $x^2 + y^2 + z^2 = 1$ in the positive octant. [10M]