R17 Regulation *Subject: 1B1AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech. I Year I Semester Supplementary Examinations, January 2024

MATHEMATICS-I

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

Maximum Marks: 70 **Date: 18.01.2024** **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

Answer all the following questions carry equal marks (10x2M=20 Marks)

1. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & -3 \\ -1 & 1 & 2 \\ 3 & 9 & -10 \end{bmatrix}$
2. Write about the consistency of the system of equations $AX = b, b \neq 0$, with n equations and n unknowns.
3. If the eigenvalues of a 3×3 matrix A are -1,2,3, then find the eigenvalues are A^2.
4. Find the nature of the quadratic form $2x_1^2 + 3x_2^2$.
5. Solve $(D^2 + 5D + 6)y = 0$.
6. Find the particular integral of $(D^2 + 4)y = cos3x$.
7. Check whether the Rolle's theorem conditions hold for $f(x) = (x-1)(x-2)(x-3)$ in [0,3].
8. Write the Taylor's series for one dimensional variable.
9. State Euler's theorem.
10. Find $\frac{dy}{dx}$ at (1,1) for $2xy - \log xy = 2$.

Part- B

Answer all the questions (5X10M=50M)

11. (a) Solve the following system of equations using Gauss elimination method. (5M)

$$2x + y - z = 4$$
$$x - y + 2z = -2$$
$$-x + 2y - z = 2$$

(b)Write the procedure to solve system of equations $AX = b$using Gauss Jordan method. (5M)

(OR)

12. Solve the equations

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 8$$

by LU decomposition method. (10M)

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

(OR)

14. Reduce the quadratic form $x_1^2 + 5x_2^2 + x_3^2 + 2x_1x_2 + 2x_2x_3 + 6x_3x_1$ to canonical form. (10M)

15. (a) Solve $(D^2 + 7D + 12)y = e^{2x} + 6$. (5M)

(b) Solve $(D^2 - 2D + 1)y = e^x(3x^2 - 2)$. (5M)

(OR)

16. Solve $(D^2 + a^2)y = \sec ax$ by method of variation of parameters. (10M)

17. (a) Verify the Lagrange's mean value theorem for the function $f(x) = x^3 - x$, [0,2]. (5M)

(b) Write the Maclaurin's series of $f(x) = cosx$. (5M)

(OR)

18. Expand $f(x, y) = e^x \cos y$ in powers of x and y at (0,0) upto third degree term by Taylor's series. (10M)

19. (a) If $\sin u = \frac{x^2y^2}{x+y}$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3\tan u$ using Euler's theorem. (5M)

(b) Find $\frac{du}{dt}$, where $u = sin\frac{x}{y}$, $x = e^t, y = t^2$. (5M)

(OR)

20. If $u = 2xy, v = x^2 - y^2, x = r\cos\theta, y = r\sin\theta$, evaluate $\frac{\partial(u,v)}{\partial(r,\theta)}$ without actual substitution. (10M)