



R17 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)

Subject: IB1AA

B.Tech. I Year I Semester Supplementary Examinations, September 2023

MATHEMATICS-I

(Common to Civil Engineering, Electrical & Electronics Engineering, Mechanical Engineering, Electronics & Communication Engineering, Computer Science & Engineering & Information Technology)

Maximum Marks: 70

Date: 29.09.2023

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

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. Write the procedure of orthogonal trajectories of polar form.
6. Find the complete solution of $(D^4 + 16)y = 0$.
7. Write the geometric interpretation of rolls mean valued theorem.
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

(5X10M=50M)

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

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

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

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

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

(OR)

12. Solve the system of equations $x + 2y + 3z = 1$, $2x + 3y + 8z = 2$, $x + y + z = 3$ (10 marks)

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 to find A^{-1} . (10 marks)

(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. (10 marks)

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

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

(OR)

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

17. Write the Maclaurin's series of $f(x) = \cos x$. (10 marks)

(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. (10 marks)

19. Find $\frac{du}{dt}$, where $u = \sin \frac{x}{y}$, $x = e^t$, $y = t^2$. (10 marks)

(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. (10 marks)