R18 Regulation *Subject code: 2B1AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, January 2024

MATHEMATICS-I

(Common to CE,ME,EEE,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 10 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=20Marks		Blooms Tx	CO
1.	Define orthogonal matrix and prove that if 'A' is an orthogonal matrix, then $A^{-1} = A^T$	L2	CO1
2.	Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 8 & 7 & 0 & 5 \end{bmatrix}$	L5	CO1
3.	Prove that if λ is an Eigen value of an orthogonal matrix then $\frac{1}{\lambda}$ is also an Eigen value.	L2	CO2
4.	Find the Eigen values of $A = \begin{bmatrix} 2 & 3+4i \\ 3-4i & 2 \end{bmatrix}$	L5	CO2
5.	State ratio test.	L3	CO3
6.	Test the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n+1}}$	L3	CO3
7.	Define chain rule of partial differentiation.	L2	CO4
8.	If $u = e^x \sin y$; $v = e^x \cos y$ then find $\frac{\partial(u,v)}{\partial(x,y)}$	L5	CO4
9.	Find the limits by change the order of integration $\int_0^a \int_{x/a}^{\sqrt{x/a}} (x^2 + y^2) dx\, dy$	L5	CO5
10.	Evaluate $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z}\, dx\, dy\, dz$	L5	CO5

PART-B

Answer all the following questions 5X10M=50Marks			
11	Discuss for what values of λ , μ the system of equations $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + \lambda z = \mu$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions [10]	L4	CO1

	OR		
12	Solve $2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$ by Gauss elimination method. [10]	L4	CO1
13	Show that the matrix satisfies Cayley - Hamilton theorem and also find the value of the Matrix $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ Where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ [10]	L4	CO2
	OR		
14	Reduce the following quadratic form to canonical form by orthogonal transformation $Q = 3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2xz$ [10]	L4	CO2
15	Show that the series $1 + \frac{1}{2^2} + \frac{2^2}{3^3} + \frac{3^3}{4^3} + \ldots\ldots\ldots$ is divergent. [10]	L3	CO3
	OR		
16	A. Test for convergence of the series $\sum \log(1 + \frac{1}{n})$ [5] B. Discuss the convergence of the series by integral test $\sum_2^\infty \frac{1}{n(\log n)^2}$ [5]	L3 L3	CO3 CO3
17	Verify $JJ^1 = 1$ for the following functions $x = u$, $y = u \tan v$, $z = w$ [10]	L2	CO4
	OR		
18	A rectangular box open at the top is to have a volume of 32 cubic units, find the dimensions of the box requiring least material for its construction. [10]	L4	CO4
19	Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz.dy.dx$ [10]	L5	CO5
	OR		
20	Evaluate $\int\int\int z^2\, dx\, dy\, dz$ taken over the volume bounded by $x^2 + y^2 = a^2$, $x^2 + y^2 = z$ and $z = 0$ [10]	L5	CO5