Course Code: 2010001 Roll No: **MLRS-R20**

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

I B.Tech I Sem Supply End Examination, October 2022

Engineering Mathematics -I

(Common to all branches)

Time: 3 Hours. **Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.
2. In Part – A, answer all questions which carries 20 marks.
3. In Part – B, answer any one question from each unit.
Each question carries 10 marks and may have a, b as sub questions.

PART- A

(10*2 Marks = 20 Marks)

1.	a)	Define normal form of a matrix.	2M	CO1	BL1
	b)	Find the rank of the matrix $\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 9 \\ 1 & 3 & 4 & 1 \end{bmatrix}$	2M	CO1	BL3
	c)	Define quadratic form of a matrix	2M	CO2	BL1
	d)	Define Eigen vector.	2M	CO2	BL1
	e)	State Cauchy mean value theorem.	2M	CO3	BL1
	f)	Compute $\frac{\Gamma(6)}{2\Gamma(3)}$	2M	CO3	BL3
	g)	If $u = x^2 - y^2, x = 2r - 3s + 4, y = -r + 8s - 5$. Find $\frac{\partial u}{\partial s}$.	2M	CO4	BL3
	h)	Find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$ if $u(x,y) = x^3y + 3y^4$	2M	CO4	BL3
	i)	Change the order of integration in the integral $\int_{-a}^{a}\int_{0}^{\sqrt{a^2-y^2}} f(x,y)dydx$	2M	CO5	BL3
	j)	Evaluate $\int_1^2\int_3^4 (xy + e^y)\ dydx$	2M	CO5	BL5

PART- B

(10*5 Marks = 50 Marks)

2	a)	Use Gauss-Jordan method to find the inverse of the matrix $\begin{bmatrix} 8 & 4 & 3 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}$.	5M	CO1	BL
	b)	Solve the system of equations $x + y + z = 11; 2x - 6y - z = 0; 3x + 4y + 2z = 0$	5M	CO1	BL
		OR			
3		For the matrix $A = \begin{bmatrix} 1 & 3 & 6 & -1 \\ 1 & 4 & 5 & 1 \\ 1 & 5 & 4 & 3 \end{bmatrix}$. Find non-singular matrices P and Q such that PAQ is in normal form. Hence find its rank.	10M	CO1	BL

4	a)	If λ be an eigen value of a non-singular matrix A, show that λ^{-1} is an eigen value of A^{-1}.	5M	CO2	BL
	b)	Find the eigen vectors of the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 0 \\ 0 & 0 & 5 \end{bmatrix}$	5M	CO2	BL
		OR			
5		Find the matrix P which diagonalizes the matrix $A = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$. Verify that $P^{-1}AP = D$, where D is a diagonal matrix. Hence find A^6.	10M	CO2	BL
6	a)	Verify Rolle's theorem for the function $f(x) = \frac{\sin x}{e^x}$ in $[0, \pi]$	5M	CO3	BL
	b)	Verify the Lagrange mean value theorem for $f(x) = \cos x$ in $(0, \pi/2)$	5M	CO3	BL
		OR			
7		Prove that $\beta(p,q) = \frac{\Gamma(p)\Gamma(q)}{\Gamma(p+q)}$	10M	CO3	BL
8	a)	Verify Euler's theorem for the function $xy + yz + zx$.	5M	CO4	BL
	b)	Find the maximum and minimum values of $f(x,y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$	5M	CO4	BL
		OR			
9		Prove that the functions $u = x + y + z$, $v = xy + yz + zx$, $w = x^2 + y^2 + z^2$ are functionally dependent and find the relation between them.	10M	CO4	BL
10	a)	Evaluate $\iint_R ydxdy$, where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$	5M	CO5	BL
	b)	Evaluate $\int_{-1/2}^{1} \int_{0}^{1+x} (x^2 + y)\, dydx$	5M	CO5	BL
		OR			
11		Evaluate $\iiint xyzdxdydz$ over the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$.	10M	CO5	BL

---oo0oo---

CO: Course Outcome **BL: Blooms Taxonomy Levels**