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

IB.TechISem Regular End Examination, April2022

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)	Find the rank of the matrix $\begin{bmatrix} 3 & 2 & -1 & 5 \\ 5 & 1 & 4 & -2 \\ 1 & -4 & 11 & -19 \end{bmatrix}$	2M	CO1	BL2
b)	Define Echelon form of a matrix	2M	CO1	BL1
c)	Find the eigen values of the matrix $\begin{bmatrix} 8 & -4 \\ 2 & 2 \end{bmatrix}$	2M	CO2	BL2
d)	Define diagonalization of a matrix	2M	CO2	BL1
e)	State Rolle's theorem	2M	CO3	BL1
f)	State Taylor's series.	2M	CO3	BL1
g)	Write the chain rule for Partial derivatives.	2M	CO4	BL3
h)	If $u = x^2 - y^2, x = 2r - 3s + 4, y = -r + 8s - 5$. Find $\frac{\partial u}{\partial r}$	2M	CO4	BL2
i)	Evaluate $\int_0^{\pi} \int_0^{x} x \sin y \, dydx$	2M	CO5	BL3
j)	Evaluate $\int_3^4 \int_1^2 (xy + e^y) \, dxdy$	2M	CO5	BL3

PART- B

(10*5 Marks = 50 Marks)

2	a)	Determine the values of b such that the rank of A is 3, where $A = \begin{bmatrix} 1 & 1 & -1 & 0 \\ 4 & 4 & -3 & 1 \\ b & 2 & 2 & 2 \\ 9 & 9 & b & 3 \end{bmatrix}$	5M	CO1	BL3
	b)	Solve the system of equations using Gauss-Seidel method $2x - y = 7; -x + 2y - z = 1; -y + 2z = 1.$	5M	CO1	BL4
		OR			
3		For the matrix $A = \begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$. Find non-singular matrices P and Q such that PAQ is in normal form.Hence find its rank.	10M	CO1	BL3
4	a)	Show that the two matrices A, $P^{-1}AP$ have the same eigen values.	5M	CO2	BL3

	b) For a matrix $A=\begin{bmatrix}1 & 2 & -3\\ 0 & 3 & 2\\ 0 & 0 & -2\end{bmatrix}$ find the eigenvalues of $3A^3+5A^2-6A+2I$.	5M	CO2	BL3
	OR			
5	Verify Cayley-Hamilton theorem and hence find the inverse of the matrix $\begin{bmatrix}1 & 2 & 3\\ 2 & -1 & 4\\ 3 & 1 & -1\end{bmatrix}$.	10M	CO2	BL4
6	a) Verify the Lagrange mean value theorem for $f(x)=x^2$ in $(1,5)$	5M	CO3	BL4
	b) Verify Cauchy's mean value theorem for the pair of functions e^x, e^{-x} in (a,b)	5M	CO3	BL4
	OR			
7	Prove that $\beta(m,n)=\dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$	10M	CO3	BL3
8	a) Prove that the functions $u=x+y+z, v=xy+yz+zx$, $w=x^2+y^2+z^2$ are dependent and find the relation between them.	5M	CO4	BL3
	b) Prove that $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}=3$,when $u=\log\left(\dfrac{x^4+y^4}{x+y}\right)$	5M	CO4	BL4
	OR			
9	If $u=\frac{1}{\sqrt{x^2+y^2+z^2}}, x^2+y^2+z^2\neq 0$ then evaluate $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}$.	10M	CO4	BL6
10	a) Evaluate $\int_0^a\int_0^{\sqrt{a^2-y^2}}(x^2+y^2)dydx$ by changing into polar coordinates.	5M	CO5	BL6
	b) Evaluate $\iint_R e^{2x+3y}dxdy$ over the triangle bounded by $x=0, y=0$ and $x+y=1$	5M	CO5	BL6
	OR			
11	Find the volume of the tetrahedron bounded by the co-ordinate planes and the plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$.	10M	CO5	BL3

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