Course Code: 1910001 Roll No: **MLRS- R19**

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 Supplementary Examination, October 2022

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 $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 1 \\ 3 & 0 & 2 \end{bmatrix}$	2M	CO1	L1
	b)	Define an orthogonal matrix and give an example.	2M	CO1	L1
	c)	Find the sum and product of the eigen values of the matrix $A = \begin{bmatrix} 1 & 3 & 4 \\ 0 & 2 & 3 \\ 0 & 0 & 3 \end{bmatrix}$	2M	CO2	L2
	d)	The product of two eigen values of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is 16. Find the third eigen value of A.	2M	CO2	L3
	e)	State Cauchy's Root test.	2M	CO3	L2
	f)	State Cauchy's integral test.	2M	CO3	L2
	g)	State Rolle's theorem	2M	CO4	L2
	h)	Find the value of $\beta(5,4)$	2M	CO4	L4
	i)	If $z = log(x^2 + y^2)$ then find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.	2M	CO5	L2
	j)	If $x = rcos\theta, y = r\, sin\theta$ then evaluate Jacobian of r, θ with respect to x, y.	2M	CO5	L5

PART- B

(10*5 Marks = 50 Marks)

2	a)	Reduce the Matrix $A = \begin{bmatrix} 1 & 4 & 3 & -2 & 1 \\ -2 & -3 & -1 & 4 & 3 \\ -1 & 6 & 7 & 2 & 9 \\ -8 & 3 & 6 & 6 & 12 \end{bmatrix}$ into Echelon form.	5M	CO1	L3
	b)	Solve $x + y + z = 9, 2x + 5y + 7z = 52, 2x + y - z = 0$ by using Gauss elimination method.	5M	CO1	L1
		OR			
3	a)	Reduce the matrix $= \begin{bmatrix} 3 & -2 & 0 & 1 \\ 0 & 2 & 2 & 7 \\ 1 & -2 & -3 & 2 \\ 0 & 1 & 2 & 1 \end{bmatrix}$ to Normal form.	5M	CO1	L5
	b)	Find whether the following equations are consistent if so solve them $2x - 3y + 7z = 5, 3x + y - 3z = 13, 2x + 19y - 47z = 32$.	5M	CO1	L6

Q.No		Question	Marks	CO	BL
4	a)	Find the eigen values and eigen vector of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$	5M	CO2	L1
	b)	If $A = \begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ then find A^{-1} by using the Cayley-Hamilton theorem.	5M	CO2	L3
		OR			
5	a)	Reduce the matrix $\begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$ to the diagonal form.	5M	CO2	L2
	b)	Write the matrix of the quadratic form $x^2 + 2y^2 - 3z^2$ and find the index and signature of the quadratic form.	5M	CO2	L1
6	a)	Test whether the series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}+\sqrt{n+1}}$ is convergent.	5M	CO3	L4
	b)	Test whether the series $\sum_{n=2}^{\infty} \frac{1}{n \log n}$ is convergent.	5M	CO3	L4
		OR			
7	a)	Test for convergence the series $x + \frac{1}{2} \cdot \frac{x^3}{3} + \frac{1.3}{2.4} \cdot \frac{x^5}{5} + \frac{1.3.5}{2.4.6} \cdot \frac{x^7}{7} + \cdots$	5M	CO3	L4
	b)	Test for convergence of the series $\sum_{n=2}^{\infty} \frac{(-1)^{n-1}}{\sqrt{n(n+1)(n+2)}}$.	5M	CO3	L4
8	a)	Verify Lagrange's theorem for $f(x) = x(x-2)(x-3)$ in the interval [0, 4].	5M	CO4	L5
	b)	Obtain Taylor's series expansion of e^x in powers of (x-1) upto 5 terms.	5M	CO4	L6
		OR			
9	a)	Verify Cauchy's mean value theorem for the functions $sinx$ and $cosx$ in the interval [a, b].	5M	CO4	L5
	b)	Show that $\int_0^{\pi/2} \sqrt{cot\theta}\, d\theta = \frac{1}{2}\Gamma\left(\frac{1}{4}\right)\Gamma\left(\frac{3}{4}\right)$	5M	CO4	L2
10	a)	If $u = sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}tanu$.	5M	CO5	L5
	b)	If $u = x \log xy$ where $x^3 + y^3 + 3xy = 1$, find $\frac{du}{dx}$.	5M	CO5	L1
		OR			
11	a)	Find the dimensions of the rectangular parallelopiped box open at the top of maximum capacity whose surface area is 108 square inches.	5M	CO5	L2
	b)	Prove that $u = \text{Sin}^{-1} x + \text{Sin}^{-1} y, v = x\sqrt{1-y^2} + y\sqrt{1-x^2}$ are functionally dependent and find the relation between them.	5M	CO5	L1

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