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)
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I B.TECH I Sem Supplementary Examination, December 2021

MATHEMATICS – I

(CE, CSE, ECE, EEE, IT, MECH)

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 the rank of a matrix.	2M	CO1	BL1
	b)	Explain the reduction of normal form.	2M	CO1	BL4
	c)	Prove that the matrices A and its transpose have the same Eigen values	2M	CO2	BL3
	d)	State Cayley-Hamilton theorem	2M	CO2	BL1
	e)	State D-Alembert's ratio test	2M	CO3	BL1
	f)	Define absolute and conditional converges of an infinite series	2M	CO3	BL1
	g)	Explain the geometrical representation of Rolle's mean value theorem.	2M	CO4	BL4
	h)	Define the Gamma function.	2M	CO4	BL1
	i)	State Euler's Theorem.	2M	CO5	BL1
	j)	Write the working rule to find the maximum and minimum values of the function f(x,y)/	2M	CO5	BL2

PART- B

(10*5 Marks = 50 Marks)

2	a)	Apply Gauss-Seidel iteration method to solve the following equations $20x+y-2z=17,\ 3x+20y-z=-18,\ 2x-3y+20z=25$	10M	CO1	BL3
		OR			
3		Investigate the values of λ and μ so that the following equations $2x+3y+5z=9, 7x+3y-2z=8, 2x+3y+\lambda z=\mu$, have (i)no solutions, (ii) a unique solutions, and (iii) an infinite number of solutions	10M	CO1	BL4
4	a)	Find the Eigen values and Eigen vectors of the matrix following matrix, $A=\begin{bmatrix}2&3&4\\0&4&2\\0&0&3\end{bmatrix}.$	5M	CO2	BL3

	b) Using Cayley-Hamilton theorem, find the inverse of $A=\begin{bmatrix}3 & 2 & 4\\4 & 3 & 2\\2 & 4 & 3\end{bmatrix}$.	5M	CO2	BL3
	OR			
5	Reduce the quadratic form $2xy+2xz-2yz$ to canonical form.	10M	CO2	BL4
6	Test the convergence of the series $\frac{1}{2}+\frac{2}{3}x+\left(\frac{3}{4}\right)^2 x^2+\left(\frac{4}{3}\right)^3 x^3+\Lambda\ \infty (x>0)$.	10M	CO3	BL5
	OR			
7	Determine the nature of the series $\sum_{n=2}^{\infty}\frac{1}{n(\log n)^p}(p>0)$.	10M	CO3	BL3
8	Prove that $(\text{if } 0<a<b<1)$, $\frac{b-a}{1+b^2}<\tan^{-1}b-\tan^{-1}a<\frac{b-a}{1+a^2}$. Hence show that $\frac{\pi}{4}+\frac{3}{25}<\tan^{-1}\frac{4}{3}<\frac{\pi}{4}+\frac{1}{6}$.	10M	CO4	BL3
	OR			
9	State and prove the relationship between Beta and Gamma Functions.	10M	CO4	BL4
10	If $u=(x^2+y^2+z^2)^{-1/2}$, then prove that $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}=0$.	10M	CO5	BL3
	OR			
11	A rectangular box open at the top is to have volume of 32 cubic feet. Find the dimensions of the box requiring least material for its construction.	10M	CO5	BL4

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