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 Supply End Examination, April 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)	Define the rank of a matrix.	2M	CO1	BL1
	b)	Find the rank of the matrix $A=\begin{bmatrix}1 & 2 & 3\\ 1 & 4 & 2\\ 2 & 6 & 5\end{bmatrix}$.	2M	CO1	BL3
	c)	Prove that, the eigen values of a triangular matrix are just the diagonal elements of the matrix	2M	CO2	BL3
	d)	State the Cayley-Hamilton Theorem.	2M	CO2	BL1
	e)	Test for the convergence of the infinite series $\sum\frac{1}{n}\sin\frac{1}{n}$.	2M	CO3	BL3
	f)	Define Absolute and Conditional convergence of an infinite series.	2M	CO3	BL1
	g)	Discuss geometrical representation of Lagranges's mean value theorem.	2M	CO4	BL2
	h)	Prove that $\Gamma(n+1)=n\Gamma(n)$.	2M	CO4	BL3
	i)	If $u=e^{-x}\cos y$ then find $u_{xx}+u_{yy}$.	2M	CO5	BL3
	j)	Write the working rule to find the maximum and minimum values of the function $f(x,y)$.	2M	CO5	BL1

PART- B

(10*5 Marks = 50 Marks)

2	Reduce the following matrix into the its normal form and hence find its rank, $$A=\begin{bmatrix}0 & 1 & -3 & -1\\ 1 & 0 & 1 & 1\\ 3 & 1 & 0 & 2\\ 1 & 1 & -2 & 0\end{bmatrix}.$$	10M	CO1	BL3
	OR			
3	Investigate the values of λ and μ so that the equations $2x+3y+5z=9;\ 7x+3y-2z=8;\ 2x+3y+\lambda z=\mu$, have (i) No solution, (ii) A unique solution and (iii) An infinite number of solutions and find solution.	10M	CO1	BL6

4	Find the Eigen values and Eigen vectors of the matrix following matrix, $$A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}.$$	10M	CO2	BL3
	OR			
5	Reduce the matrix $A = \begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ to diagonal form.	10M	CO2	BL3
6	Test the convergence of the series $\frac{1}{2} + \frac{2}{3}x + \left(\frac{3}{4}\right)^2 x^2 + \left(\frac{4}{3}\right)^3 x^3 + \cdots \infty (x > 0).$	10M	CO3	BL5
	OR			
7	Discuss the convergence of the series $\sum \frac{n^n x^n}{n!}$.	10M	CO3	BL2
8	Expand $\log_e(1+x)$ in ascending powers of x.	5M	CO4	BL4
	OR			
9	State and prove the relationship between Beta and Gamma Functions.	10M	CO4	BL3
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	If $J = \frac{\partial(u,v)}{\partial(x,y)}$ and $J^1 = \frac{\partial(x,y)}{\partial(u,v)}$, then prove that $JJ^1 = 1$.	10M	CO5	BL3

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