Final:- 08-12-2021

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 Examination, December 2021

Engineering Mathematics-I

(Common to all branches)

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

Note: 1. Answer any FIVE questions.
2. Each question carries 14 marks and may have a, b as sub questions.

1	a)	Determine the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$	7M	CO1	BL3
	b)	Express the matrix A as a sum of symmetric and skew-symmetric matrix where A=$\begin{bmatrix} 3 & -2 & 6 \\ 2 & 7 & -1 \\ 5 & 4 & 0 \end{bmatrix}$	7M	CO1	BL4
2	a)	If Q = $\begin{bmatrix} \frac{-2}{3} & \frac{1}{3} & \frac{2}{3} \\ \frac{2}{3} & \frac{2}{3} & \frac{1}{3} \\ \frac{1}{3} & \frac{-2}{3} & \frac{2}{3} \end{bmatrix}$ then Prove that the matrix Q orthogonal.	7M	CO1	BL3
	b)	Solve the system of equations by matrix method. x+2y+3z = 0, 3x+4y+4z = 0, 7x+10y+12z =0.	7M	CO1	BL3
3	a)	Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$	7M	CO2	BL3
	b)	Find the inverse of the matrix A = $\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ by using Cayley-Hamilton Theorem.	7M	CO2	BL3
4	a)	Reduce the matrix A= $\begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ to the diagonal form.	7M	CO2	BL4
	b)	Prove that $\frac{b-a}{1+b^2} < \tan^{-1} b - \tan^{-1} a < \frac{b-a}{1+a^2}$ if 0<a<b.	7M	CO3	BL3
5	a)	If $f(x) = \log(1+x), x > o$, *using meclaurin's theorem*, show that for $0 < \theta < 1$, $log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3(1+\theta x)^3}$	7M	CO3	BL3
	b)	Show that $\beta(m,n) = \frac{\tau(m).\tau(n)}{\tau(m+n)}$	7M	CO3	BL3

6	a)	If $H = \log(x^3 + y^3 + z^3 - 3xyz)$ then show that $\left(\frac{\partial}{\partial x}+\frac{\partial}{\partial y}+\frac{\partial}{\partial z}\right)^2 H = \frac{-9}{(x+y+z)^2}$.	7M	CO4	BL3
	b)	If $u = \log\left(\frac{x^4+y^4}{x+y}\right)$ then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3$	7M	CO	BL4
7	a)	Determine the minimum value of $x^2 + y^2 + z^2$ subject to the conditions x + 2y- 4z= 5.	7M	CO4	BL3
	b)	Evaluate $\int_0^5 \int_0^{x^2} x(x^2 + y^2)dxdy$.	7M	CO5	BL5
8	a)	Change the order of integration and hence evaluate $I = \int_0^a \int_{\sqrt{ax}}^a \frac{y^2}{\sqrt{y^4 - a^2x^2}}dxdy.$	7M	CO5	BL5
	b)	Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyzdxdydz$	7M	CO5	BL5

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