H.T NO.										

MLR18

Course Code: A4BS02

MLR INSTITUTE OF TECHNOLOGY

(An Autonomous Institute)

I B.Tech. I Semester Supplementary Examination September-2023

LINEAR ALGEBRA AND CALCULUS

(Common to CSE & IT)

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

Note: 1. This question paper contains two parts A and B.
2. Part -A is Compulsory which carries 20 marks. Answer all Questions in part A.
3. Part -B consists 5units.Answer any one question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A **10 x 2M = 20Marks**

1.	a)	Find Integrating factor of $\frac{dy}{dx} - \frac{y}{x} = x$	2M	CO1	BL3
	b)	Solve $(D^2+4)y = sin\, 2\,x$	2M	CO1	BL3
	c)	Test for convergence of the series $\sum_{n=1}^{\infty} \frac{n!}{n^n}$.	2M	CO2	BL4
	d)	Test for convergence of the series $\sum_{n=1}^{\infty} ne^{-n^2}$.	2M	CO2	BL4
	e)	Find the value of k such that the rank of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & k & 7 \\ 3 & 6 & 10 \end{bmatrix}$ is 2.	2M	CO3	BL1
	f)	Define Orthogonal matrix and Unitary matrix.	2M	CO3	BL1
	g)	Explain, Why the set $S = \{(2,1,-2),(-2,-1,2),(4,2,-4)\}$ is not a basis of R^3.	2M	CO4	BL2
	h)	Find the nullity of the matrix A=$\begin{pmatrix} 1 & 1 & 1 & 1 \\ 2 & 3 & 4 & 5 \end{pmatrix}$	2M	CO4	BL2
	i)	Find a unit vector which is orthogonal to the vector $\alpha = (2,-1,6)$ of $V_3(R)$ with respect to standard inner product.	2M	CO5	BL2
	j)	Find the eigen values of A, Where A=$\begin{bmatrix} 1 & 2 \\ 0 & 4 \end{bmatrix}$	2M	CO5	BL1

PART- B **5 x 10M = 50Marks**

2	a)	Solve $(2x-y+1)dx + (2y-x-1)dy = 0$	5M	CO1	L3
	b)	Solve $(D^2 + a^2)y = tanax$ by method of variation of parameters.	5M	CO1	L3
OR					
3		Solve $D^2+3D+2)y = e^x sinx$.	10M	CO1	L3
4	a)	Test the convergence of the series $\sum_{n=1}^{\infty} \frac{1^2.5^2.9^2.....(4n-3)^2}{4^2.8^2.12^2......(4n)^2}$	5M	CO2	L4
	b)	Test the convergence of the series $\sum_{n=1}^{\infty}(1+\frac{1}{\sqrt{n}})^{-n^{\frac{3}{2}}}$.	5M	CO2	L4
OR					
5	a)	Test the convergence of the series $\frac{2}{1}+\frac{3}{2}+\frac{4}{3}+\frac{5}{4}$ …………..	5M	CO2	L4
	b)	Show that $1-\frac{1}{2!}+\frac{1}{4!}-\frac{1}{6!}+\cdots$ ……….. is absolutely convergent.	5M	CO2	L4

6	a)	If $A = \begin{bmatrix} 3 & 7-4i & -2+5i \\ 7+4i & -2 & 3+i \\ -2-5i & 3-i & 4 \end{bmatrix}$ then show that matrix A is Hermitian and matrix iA is Skew-Hermitian.	5M	CO3	L3
	b)	Convert the given matrix into Normal form and hence find it's rank where $A = \begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$	5M	CO3	L5
OR					
7	a)	Solve the following system of equations $x+y-3z+2w=0,\ 2x-y+2z-3w=0,$ $3x-2y+z-4w=0,\ \ -4x+y-3z+w=0.$	5M	CO3	L3
	b)	Test for consistency and solve the system of equations $x-2y-3z=1,\ \ 3x+4y-6z=-2,\ \ 4x+2y-3z\ =5.$	5M	CO3	L4
8		The linear transformation $T: V_2 \to V_3$ is defined as $T(x,y)=(x,x+y,y)$ then find the Range, Kernel, Rank and Nullity of T. and also find whether T is one-one or not?	10M	CO4	L3
OR					
9		Find the matrices of the linear transformation T on $V_3(R)$ defined as $T(a,b,c)=(2b+c,a-4b,3a)$ with respect to standard ordered basis $B=\{(1,0,0),(0,1,0),(0,0,1)\}$ and ordered basis $B^1=\{(1,1,1),(1,1,0),(1,0,0)\}$.	10M	CO4	L4
10		Diagonalize the matrix A=$\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$	10M	CO5	L3
OR					
11		Apply Gram-Schmidt orthogonalization process to the vectors $\boldsymbol{\beta}_1$= (1,0,1),$\boldsymbol{\beta}_2$= (1,0,-1), $\boldsymbol{\beta}_3$= (0,3,4) to obtain an orthonormal basis ($\propto_1,\propto_2,\propto_3$) for R^3 With Standard inner product.	10M	CO5	L3

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