

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)**

I B.Tech I Semester Supplementary Examinations, July –2024

**LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS
(EEE)**

Time: 3 hours

Max. Marks: 70

**Answer ONE Question from each Unit
All Questions Carry Equal Marks**

Q. No.	Question	BTL	CO	Marks
UNIT – I				
1.	a) Find the rank of the matrix A by reducing it to the normal form $\text{where } A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & -4 \\ 2 & 3 & 5 & -5 \\ 3 & -4 & -5 & 8 \end{bmatrix}$	K3	CO1	7M
	b) Prove that the following set of equations are consistent and solve them. $3x + 3y + 2z = 1$; $x + 2y = 4$; $10y + 3z = -2$; $2x - 3y - z = 5$.	K3	CO1	7M
OR				
2.	Obtain the Eigen values and Eigen vectors of $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	K3	CO1	14M
UNIT – II				
3.	State Cayley –Hamilton theorem. Verify Cayley –Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$. Hence find A^{-1}	K3	CO2	14M
OR				
4.	Reduce $8x^2 + 7y^2 + 3z^2 - 12xy + 4xz - 8yz$ into canonical form by orthogonal transformation and hence find its rank, index and signature.	K3	CO2	14M
UNIT – III				
5.	a) Evaluate $\int_0^2 \int_0^x y \, dy \, dx$	K3	CO3	7M
	b) Evaluate $\iint_R y \, dx \, dy$ where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$	K3	CO3	7M
OR				
6.	a) Evaluate $\int_1^e \int_1^y \int_1^{e^x} \log z \, dz \, dx \, dy$	K3	CO3	7M
	b) Find the volume bounded by the xy-plan, the cylinder $x^2 + y^2 = 1$ and the plane $x + y + z = 3$.	K3	CO3	7M
UNIT – IV				

7.	a)	If $z = \log(e^x + e^y)$ show that $rt - s^2 = 0$	K3	CO4	7M
	b)	Show that the functions $u = xy + yz + zx, v = x^2 + y^2 + z^2$ and $w = x + y + z$ are functionally related. Find the relation between them.	K3	CO4	7M
OR					
8.		A rectangular box open at the top is to have of 32 cubic ft. Find dimensions of the box requiring least material for its construction	K3	CO4	14M
UNIT – V					
9.	a)	Find the Partial differential equation by eliminating 'f' from $z = f(xy + z)$.	K2	CO5	7M
	b)	Solve $yzp - xzq = xy$	K3	CO5	7M
OR					
10.	a)	Solve $zp = q + 1$	K3	CO5	7M
	b)	Solve one dimensional wave equation $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$ subject to $y(0, t) = 0, y(\pi, t) = 0, y(x, 0) = \sin 2x$ and $\frac{\partial y}{\partial t}(x, 0) = 0$, where $0 \leq x \leq \pi$ and $t \geq 0$.	K3	CO5	7M