

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)
I B.Tech I Semester Supplementary Examinations, July – 2024

LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS
 (Common to all branches)

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit
 All Questions Carry Equal Marks

Q. No.	Questions	BTL	CO	Marks
UNIT – I				
1.	a) Determine the rank of the matrix $A = \begin{bmatrix} 3 & 0 & 2 & 2 \\ -1 & 7 & 4 & 9 \\ 7 & -7 & 0 & -5 \end{bmatrix}$ by reducing into Echelon form.	K2	CO1	7M
	b) Test for consistency of the following system of equations and if so solve them $x + 2y + 2z = 2, 3x - y + 3z = -4, x + 4y + 6z = 0$	K3	CO1	7M
OR				
2.	Obtain Eigen values and their corresponding Eigen vectors of the matrix $A = \begin{bmatrix} 5 & -2 & 0 \\ -2 & 6 & 2 \\ 0 & 2 & 7 \end{bmatrix}$	K3	CO1	14M
UNIT – II				
3.	Verify Cayley - Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$. Make use of it find the inverse of A and A^4 .	K3	CO2	14M
OR				
4.	Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ in to the canonical form by orthogonal linear transformation. And hence find rank, index and signature and also write the nature of the quadratic form.	K3	CO2	14M
UNIT – III				
5.	a) Solve $(y^4 + 2y)dx + (4xy^3 + 2y^4 + 2x)dy = 0$.	K2	CO3	7M
	b) The number of bacteria in a culture was initially 100 and increased to 332 in one hour. Find the number of bacteria in a culture after 1.5 hours.	K3	CO3	7M
OR				

6.	a)	Solve $(y \log y) dx + (x - \log y) dy = 0$.	K2	CO3	7M
	b)	The air is maintained at 30^0C and the temperature of the body cools from 80^0C to 60^0C in 12 minutes, find the temperature of the body after 24 minutes.	K3	CO3	7M
UNIT – IV					
7.	a)	Solve $(D^2 - 5D + 4)y = 2e^{3x} + 5\sin 2x$.	K3	CO4	7M
	b)	Solve $(D^2 - 3D + 2)y = e^x \cos 2x$.	K3	CO4	7M
OR					
8.		Utilize method of variation of parameters to solve $(D^2 + 9)y = \tan 3x$.	K3	CO4	14M
UNIT – V					
9.	a)	Evaluate $\frac{\partial w}{\partial u}$ and $\frac{\partial w}{\partial v}$ if $w = xy + yz + zx$, $x = u + v$, $y = u - v$, $z = uv$	K2	CO5	7M
	b)	Find the minimum value of $x^2 + y^2 + z^2$, given that $ax + by + cz = p$.	K3	CO5	7M
OR					
10.	a)	If $u = 3x + 2y - z$, $v = x - 2y + z$ and $w = x(x + 2y - z)$ then find the Jacobian.	K2	CO5	7M
	b)	Examine extremes of the function $f(x, y) = xy + \frac{a^3}{x} + \frac{a^3}{y}$	K3	CO5	7M