RAYALASEEMA UNIVERSITY COLLEGE OF ENGINEERING, KURNOOL – 518007

B. Tech I Semester (RU23) I Sessional Examinations – October-2024

LINEAR ALGEBRA AND CALCULUS (23ASH9905)

(Common to I Semester AI, CE, CSE, ECE, and ME)

2JRU1A05A9

Time: 90 min Date: 14/10/2024 AN Max. Marks:30

Answer ONE FULL question from each unit **All the Questions Carry EQUAL marks**

Q.No		Question	Unit	BT Level	CO covered	Marks Allotted
1	a)	Find the value of λ for which the system of equations $3x - y + 4z = 3$, $x + 2y - 3z = -2$, $6x + 5y + \lambda z = -3$ Will have infinite number of solutions and solve them.	I	L4	CO1	(8M)
	b)	Find the rank of the matrix A by reducing it to Echelon form. $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 4 \\ 7 & 10 & 12 \end{bmatrix}$	I	L1	CO1	(2M)
		(OR)				
2	a)	Solve the system of equations using Gauss – Seidel iteration method. $27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$	I	L4	CO1	(8M)
	b)	Find the inverse of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ by Gauss – Jordan Method.	I	L1	CO1	(2M)
3	a)	Diagonalize the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ and hence calculate A^4.	II	L4	CO2	(8M)
	b)	Write the matrix corresponding to the quadratic form $x^2 + y^2 + z^2 + 4xy - 2yz + 6xz$.	II	L4	CO2	(2M)
		(OR)				
4	a)	Find the Eigen values and Eigen vector of the matrix $A = \begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & 2 \\ 0 & -6 & -3 \end{bmatrix}$	II	L4	CO2	(8M)
	b)	Determine the nature of the quadratic form $x^2 + y^2 + z^2 - 2xy$.	II	L4	CO2	(2M)
5	a)	Verify Cayley – Hamilton theorem for $A \begin{bmatrix} 2 & 1 & 2 \\ 5 & 3 & 3 \\ -1 & 0 & -2 \end{bmatrix}$.	II	L5	CO2	(8M)
	b)	Find the Eigen values of adj A if $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.	II	L5	CO2	(2M)
		(OR)				
6	a)	Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2zx$ to canonical form and hence state its nature, index and signature.	V	L6	CO2	(8M)
	b)	State Cayley – Hamilton theorem.	V	L1	CO2	(2M)

P. Chaitanya

RAYALASEEMA UNIVERSITY COLLEGE OF ENGINEERING, KURNOOL – 518007

B. Tech I Semester (RU23) II Sessional Examinations – December-2024

LINEAR ALGEBRA AND CALCULUS (23ASH9905)

(Common to I Semester AI, CE, CSE, ECE, and ME)

24RUIA05A9

Time: 90 min **Date: 11/12/2024 AN** **Max. Marks:30**

Answer ONE FULL question from each unit **All the Questions Carry EQUAL marks**

Q.No		Question	Unit	BT Level	CO covered	Marks Allotted
1	a)	State and Prove Lagrange's mean value theorem.	III	L4	CO3	(8M)
	b)	State Rolle's mean value theorem.	III	L1	CO3	(2M)
		(OR)				
2	a)	If $a < b$, then prove that $\frac{b-a}{(1+b^2)} < tan^{-1}b - tan^{-1}a < \frac{b-a}{(1+a^2)}$ using Lagrange's mean value theorem. Hence deduce the following. 1) $\frac{\pi}{4} + \frac{3}{25} < tan^{-1}\frac{4}{3} < \frac{\pi}{4} + \frac{1}{6}$ 2) $\frac{5\pi+4}{20} < tan^{-1}2 < \frac{\pi+2}{4}$	III	L4	CO3	(8M)
	b)	State Cauchy's mean value theorem.	III	L1	CO3	(2M)
3	a)	If $x = \sqrt{vw}, y = \sqrt{wu}, z = \sqrt{uv}$ and $u = r\,sin\theta\,cos\emptyset, v = r\,sin\theta\,sin\emptyset, w = rcos\theta$, then find $J\left(\frac{x,y,z}{r,\theta,\emptyset}\right)$.	IV	L4	CO4	(8M)
	b)	If $f(x,y) = log\left(\sqrt{x^2+y^2}\right)$ then find $\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}$.	IV	L4	CO4	(2M)
		(OR)				
4	a)	If $x^x y^y z^z = e$, show that at $x = y = z$, $\frac{\partial^2 z}{\partial x \partial y} = -(x \log ex)^{-1}$.	IV	L4	CO4	(8M)
	b)	If $u = \frac{y}{x}, v = xy$, then find $J\left(\frac{u,v}{x,y}\right)$.	IV	L4	CO4	(2M)
5	a)	Evaluate $\int_0^2 \int_0^{\sqrt{2x-x^2}} (x^2+y^2)\,dx\,dy$ by changing into polar coordinates.	V	L5	CO5	(8M)
	b)	Evaluate $\int_0^1 \int_0^1 \int_0^1 dx\,dy\,dz$.	V	L.5	CO5	(2M)
		(OR)				
6	a)	Using triple integral, find the volume of the sphere whose radius is 'a' units.	V	L.6	CO5	(8M)
	b)	Evaluate $\int_0^{\pi} \int_0^{a\,sin\theta} r\,dr\,d\theta$.	V	L.1	CO5	(2M)