(BR23) 05/01/2026 QP'S Course Code: 23BS1T01

BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE::ODALAREVU

(AUTONOMOUS)

I B.Tech I Semester Regular/ Supplementary **Examinations, JAN-2026 (BR23)**

Linear Algebra & Calculus (Common to All Branches)

Time: 3 hours Max. Marks: 70

Question Paper consists of Part-A and Part-B

Answer ALL the question in Part-A

Part-B consists of 5 questions with either/or choice, answer any one from either/or

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PART–A (10X2 = 20M)

		BTL	CO	Marks
1.a)	Define Symmetric and Skew- Symmetric matrices.	BTL1	CO1	(2M)
b)	Define the rank of matrix.	BTL1	CO1	(2M)
c)	Find the symmetric matrix corresponding to the quadratic form$3x^2+3y^2+3z^2+4xy+8yz+8xz$.	BTL2	CO2	(2M)
d)	State Cayley-Hamilton Theorem	BTL1	CO2	(2M)
e)	State Rolle's Mean Value Theorem	BTL1	CO3	(2M)
f)	Write the statement of Taylor's theorem	BTL1	CO3	(2M)
g)	If $x = u(1+v), y = v(1+u)$ then prove that $\frac{\partial(x,y)}{\partial(u,v)} = 1+u+v$	BTL2	CO4	(2M)
h)	Find the Jacobian of the functions $u = \frac{x^2-y^2}{x^2+y^2}, v = \frac{2xy}{x^2+y^2}$	BTL2	CO4	(2M)
i)	*Evaluate* $\int_0^2 \int_0^x y dy\, dx$	BTL2	CO5	(2M)
j)	Evaluate $\int_0^2 \int_1^3 \int_0^1 (x^2+yz)\, dxdydz$	BTL2	CO5	(2M)

PART–B (5X10 = 50M)

		BTL	CO	Marks
	UNIT-I			
2.(a)	Find the rank of the matrix $\begin{bmatrix} 2 & 1 & 3 & 4 \\ 0 & 3 & 4 & 1 \\ 2 & 3 & 7 & 5 \\ 2 & 5 & 11 & 6 \end{bmatrix}$ by reducing it to normal form.	BTL3	CO1	(5M)
2.(b)	Reduce the matrix to Echelon form = $\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$ and find its rank.	BTL2	CO1	(5M)
	(OR)			

3.(a)	Solve the system of equations using Gauss Siedel iteration method $10x_1 + x_2 + x_3 = 12$, $x_1 + 10x_2 - x_3 = 10$ and $x_1 - 2x_2 + 10x_3 = 9$	BTL3	CO1	(10M)
	UNIT-II			
4.(a)	Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 2 & 1 & 2 \\ 5 & 3 & 3 \\ -1 & 0 & -2 \end{bmatrix}$. Hence find A^{-1}.	BTL3	CO2	(10M)
	(OR)			
5.(a)	Reduce the Quadratic form $8x^2+7y^2+3z^2-12xy+4xz-8yz$ to the canonical form by orthogonal reduction. Hence mention the nature of it.	BTL	CO2	(10M)
	UNIT-III			
6.(a)	Verify Rolle's theorem for $f(x) = 2x^3 + x^2 - 4x - 2$ in $[-\sqrt{2}, \sqrt{2}]$	BTL3	CO3	(5M)
6.(b)	Verify Lagranges Mean Value Theorem for $f(x) = \cos x$ in $[0, \frac{\pi}{2}]$	BTL3	CO3	(5M)
	(OR)			
7.(a)	Verify Cauchy's mean value theorem for $f(x) = \sin x$ and $g(x) = \cos x$ in $[0,\pi/2]$.	BTL3	CO3	(5M)
7.(b)	Obtain the Maclaurins series expansion of the function $f(x) = \sin x$.	BTL2	CO3	(5M)
	UNIT-IV			
8.(a)	If $x = e^r \sec\theta$, $y = e^r \tan\theta$ Prove that $\frac{\partial(x,y)}{\partial(r,\theta)} \cdot \frac{\partial(r,\theta)}{\partial(x,y)} = 1$.	BTL2	CO4	(5M)
8.(b)	Find the maximum value of $u = x^2y^3z^4$ if $2x+3y+4z = a$.	BTL3	CO4	(5M)
	(OR)			
9.(a)	Show that the functions $u = x + y + z, v = xy + yz + zx$ and $w = x^2 + y^2 + z^2$ are functionally dependent	BTL3	CO4	(10M)
	UNIT-V			
10.(a)	Apply change of order of integration and evaluate $\int_0^1 \int_1^{2-x} xydxdy$	BTL3	CO5	(10M)
	(OR)			
11.(a)	Find $\iint (x+y)^2 \, dx \, dy$ *over the area bounded by the ellipse* $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	BTL3	CO5	(10M)

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