VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
(Accredited by NAAC with A++ Grade)
B.E. III-Semester Bridge Course Main & Backlog Examinations, February-2024
Matrix Theory and Vector Calculus
(Common to CSE, AIML, EEE, ECE & IT)

Time: **3 hours**   Max. Marks: **50**

*Note: Answer all questions from **Part-A** and any FIVE from **Part-B***

Part-A (10× 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Find the derivative of $x^2 logx$.	2	2	1	1,12
2.	Evaluate $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ if $z = xy - xsinxy$.	2	2	1	1,12
3.	Define the Gradient of the Scalar function.	2	1	2	1,12
4.	Define the Divergence and Curl of a vector function.	2	1	2	1,12
5.	State the Green's theorem in the plane.	2	1	3	1,12
6.	Evaluate $\int_0^1 \int_0^1 \frac{dxdy}{\sqrt{(1-x^2)(1-y^2)}}$.	2	2	3	1,12
7.	Define rank of matrix.	2	1	4	1,12
8.	Define consistency and inconsistency of the system of equations.	2	1	4	1,12
9.	Find $\int x^2 cosxdx$.	2	1	1	1,12
10.	Show that the vector $(x^2yz^3)i + (xy^2z^3)j - (xyz^4)k$ is solenoidal vector.	2	2	2	1,12

Part-B (5×6 = 30Marks)

11. a)	If $u = x^3 + y^3 - 3axy$, Verify $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$.	3	2	1	1,12
b)	If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then Show that $\left[\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right]^2 u = -9(x + y + z)^{-2}$.	3	3	1	1,12
12. a)	Find the directional derivative of $x^3 + y^3 + 3xyz$ at $(1,1,1)$ in the direction of $i + 2j + k$.	3	2	2	1,2
b)	Evaluate Divergence and Curl of $2x^2zi - xy^2zj + 3yz^2k$ at $(1,1,1)$.	3	2	2	1,12
13. a)	Apply the Green's theorem to evaluate $\int_C [(xy + y^2)dx + x^2 dy]$, where C is bounded by $y = x$ and $y = x^2$.	3	3	3	1,2
b)	Evaluate $\int_0^4 \int_0^{x^2} e^{\frac{y}{x}} dydx$.	3	3	3	1,12

14.	Find the Eigen values and Eigen vector of the matrix $\begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$.	6	3	4	1,12
15. a)	Evaluate $\int_0^\pi \frac{\sqrt{1-\cos\theta}}{1+\cos\theta} \sin^2\theta\, d\theta$.	3	3	1	1,12
b)	Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at point (2, -1, 2).	3	3	2	1,12
16. a)	Evaluate $\int_0^3 \int_1^2 xy(1 + x + y)dydx$.	3	2	3	1,12
b)	Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$	3	2	4	1,12
17.	Answer any *two* of the following:				
a)	If $z = e^{ax+by}.f(ax + by)$, then prove that $b\frac{\partial z}{\partial x} + a\frac{\partial z}{\partial y} = 2abz$.	3	2	1	1,12
b)	Show that the vector $(x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)k$ is irrotational.	3	3	2	1,12
c)	Evaluate $\iint_R y\, dxdy$ where R is region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$.	3	3	3	1,12

M : Marks;   L: Bloom's Taxonomy Level;   CO; Course Outcome;   PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	18.46%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	41.54%

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