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Code No. : 14712 AS N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. IV-Semester (Bridge Course) Advanced Suppl. Examinations, Aug./Sep.-2023

Matrix Theory and Vector Calculus

(Common to Civil & Mech.)

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.	If $U = f(x, y, z)$ where x, y and z are functions of r and s , then write the chain rule.	2	1	1	1,12
2.	Evaluate $\int \sin 2x \cdot \cos x \, dx$	2	1	1	1,12
3.	Define Solenoidal and Irrotational vector.	2	1	2	1,12
4.	If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ and $r = \vec{r} $, then find $\nabla(r^3)$.	2	2	2	1,12
5.	State Gauss Divergence theorem.	2	1	3	1,12
6.	Evaluate $\int_1^2 \int_x^{x^2} dy dx$	2	2	3	1,12
7.	Write the condition for consistence of Non-homogeneous system of equations.	2	1	4	1,12
8.	Define Eigen value and Eigen vector of a matrix.	2	1	4	1,12
9.	If $x + y + z = \log z$, then find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.	2	2	1	1,12
10.	Write the geometric Interpretation of Gradient.	2	1	2	1,12
Part-B (5 × 6 = 30 Marks)					
11.	If $U = f\left(\frac{y-x}{xy}, \frac{z-x}{xz}\right)$, then show that $x^2 \frac{\partial U}{\partial x} + y^2 \frac{\partial U}{\partial y} + z^2 \frac{\partial U}{\partial z} = 0$.	6	3	1	1,12
12. a)	Find the directional derivative of $f = x^2 - y^2 + 2z^2$ at the point $A(1, 2, 3)$ in the direction of the vector $4\vec{i} + 2\vec{j} + \vec{k}$.	3	3	2	1,12
b)	Find the curl of $\vec{F} = (x^2yz)\vec{i} + (xy^2z)\vec{j} + (xyz^2)\vec{k}$ at $(1, 2, 3)$	3	2	2	1,12
13.	Apply Green's theorem to find work done $\int_C \vec{F} \cdot d\vec{r}$ in moving particle in the force field $\vec{F} = (3x - 8y^2)\vec{i} + (4y - 6xy)\vec{j}$ along the curve C where C is bounded by $x = 0$, $y = 0$ and $x + y = 1$.	6	3	3	1,12

Contd... 2

14. a)	Find Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$	4	3	4	1,12
b)	Write any two elementary Row transformations of a matrix	2	1	4	1,12
15. a)	If $Z = \tan^{-1}\left(\frac{y}{x}\right)$, then Verify that $\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}$	3	2	1	1,12
b)	Find the values of a & b such that the surface $ax^2 - byz = (a + 2)x$ and $4x^2y + z^3 = 4$ cut orthogonally at the point $(1, -1, 2)$.	3	3	2	1,12
16. a)	Apply Stoke's theorem to evaluate $\int_C \vec{F} \cdot d\vec{r}$ for the vector field $\vec{F} = (2x - y)\vec{i} - (yz^2)\vec{j} - (zy^2)\vec{k}$ over the upper half of the surface $x^2 + y^2 + z^2 = 1$ bounded by its projection on the xy -plane.	3	3	3	1,12
b)	Solve the system $3x + y + 2z = 3, 2x - 3y - z = -3, x + 2y + z = 4$.	3	2	4	1,12
17.	Answer any <i>two</i> of the following:				
a)	Evaluate $\int_0^a \frac{x^7}{\sqrt{(a^2 - x^2)}} dx$	3	2	1	1,12
b)	If $\vec{F} = 3y^4z^2\vec{i} + 4x^3z^2\vec{j} + 3y^2x^2\vec{k}$, then find $\nabla \times \vec{F}$ at $(1, -2, 0)$	3	2	2	1,12
c)	Evaluate $\int_0^2 \int_1^3 \int_1^2 xy^2z dzdydx$	3	2	3	1,12

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

i)	Blooms Taxonomy Level - 1	24.62%
ii)	Blooms Taxonomy Level - 2	36.92%
iii)	Blooms Taxonomy Level - 3 & 4	38.46%
