Reg. No. | | | | | | | | |

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

UG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.
(For those admitted in June 2023 and later)

PROGRAMME AND BRANCH: B.SC., PHYSICS/CHEMISTRY

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
II	PART - III	ELECTIVE GENERIC-2	U23MA2A2	VECTOR CALCULUS

Date & Session: 03.05.2025/FN **Time: 3 hours** **Maximum: 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	**SECTION – A (10 X 1 = 10 Marks)** Answer **ALL** Questions.
CO1	K1	1.	A physical quantity which has only magnitude is________. a) scalar b) vector c) matrix d) set
CO1	K2	2.	Discuss a physical quantity both magnitude and direction is named as______. a) scalar b) vector c) matrix d) set
CO2	K1	3.	A vector **F** is called harmonic vector if a) $\nabla^2 R = f$ b) ∇^2 F = 0 c) F=0 d) None of these
CO2	K2	4.	If ∇ X **V**=0. Then **V** is said to be_______vector a) irrotational b) variable c) solenoidal d) constant
CO3	K1	5.	If a vector field **F** is such that **F**= ∇Ø then F said to be_________. a) variable b) conservative c) Parallel field d)None
CO3	K2	6.	If **F**=2x**i**+y**j**+z**k** then ∇. **F** = a) 0 b) 2 c)1 d) 4
CO4	K1	7.	If F=x**i**+y**j**+az**k** is solenoidal then 'a' is ------ a) 0 b) 2 c) -2 d) 1
CO4	K2	8.	The necessary and sufficient condition that ∫ f.dr be independent of the path is _________. a) F= ∇Ø b) ∇ x F =0 c) ∇ . F=0 d)3
CO5	K1	9.	Green's theorem in space is same as -------theorem a) Stoke's b) Gauss convergence c) Gauss divergence d) Fermat's
CO5	K2	10.	By Stoke's theorem if **r**=xi+yj+z k then ∬ (∇ x r)n.ds = a) -1 b) 1 c) none d)0

Course Outcome	Bloom's K-level	Q. No.	**SECTION – B (5 X 5 = 25 Marks)** Answer **ALL** Questions choosing either (a) or (b)
CO1	K3	11a.	Find the directional derivative of Ø =xy^2 +yz^3 at the point (2,-1,1) in the direction of **i**+2**j**+2**k**
			(OR)
CO1	K3	11b.	Find the unit normal to the surface x^3-xyz+z^3 =1 at (1,1,1)

CO2	K3	12a.	Find the curl (curl **F**) at the point (1,1,1) if $F=x^2y\mathbf{i}+xz\mathbf{j}+2yz\mathbf{k}$
			(OR)
CO2	K3	12b.	P.T div **r** =3 and curl **r**=0 when r is the position vector of a point (x,y,z) in space.
CO3	K4	13a.	Evaluate $\int f.dr$ over C where $f=(x^2+y^2)\,\mathbf{i}+(x^2-y^2)\mathbf{j}$ and c is the curve $y=x^2$ joining (0,0) and (1,1)
			(OR)
CO3	K4	13b.	If $f = x^2\mathbf{i}-xy\mathbf{j}$ and C is the straight line joining the points (0,0) and (1,1) Evaluate integral over $\int f.\,dr$ over C
CO4	K4	14a.	Explain the volume of the sphere $x^2+y^2+z^2=a^2$ as a volume integral
			(OR)
CO4	K4	14b.	Evaluate by using stoke's Theorem $\int yzdx + zx\,dy + xy\,dz$ where C is the curve $X^2 + Y^2 =1$, $Z= Y^2$
CO5	K5	15a.	using green's Theorem, Evaluate $\int(xy-x^2)dx+x^2\,y\,dy$ along the closed curve C formed by y=0,x =1,and y = x
			(OR)
CO5	K5	15b.	State the Gauss divergence Theorem.

Course Outcome	**Bloom's K-level**	**Q. No.**	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	16a.	Find the equation of the (i)Tangent plane (ii)Normal line to the surface xyz=4 at the point (1,2,2)
			(OR)
CO1	K3	16b.	Find the angle between the surfaces $x^2+y^2+z^2=29$ and $x^2+y^2+z^2+4x-6y-8z-47=0$ at (4,-3,2)
CO2	K4	17a.	P.T the curl (r x a) = -2a where a is a constant vector
			(OR)
CO2	K4	17b.	P.T div(r^n **r**)=(n+3)r^n . Deduce that r^n **r** is a solenoidal iff n=-3
CO3	K4	18a.	Find the workdone by the force $F=3xy\mathbf{i}-5z\mathbf{j}+10x\mathbf{k}$ along $x=t^2$, $y=2t^2$, $z=t^3$ from t=1 to t=2
			(OR)
CO3	K4	18b.	Evaluate $\int f.\,dr$ over C where $f=(3x^2+6xy)\mathbf{i}+(3x^2 - y^2)\,\mathbf{j}$ along the curve y=2x joining the points(0,0), (1,2)
CO4	K5	19a.	Evaluate $\int_0^{\log x}\int_0^{x}\int_0^{x+y} e^{x+y+z}\,dzdydx$
			(OR)
CO4	K5	19b.	Justify green's theorem for the function $f=(x^2+y^2)\mathbf{i}-2xy\mathbf{j}$ and the curve c is the rectangle in the xy plane bounded by y=0,y=b , x=0 ,x=a
CO5	K5	20a.	Justify Stoke's theorem for the function $f= y^2\mathbf{i}+y\mathbf{j} -x\,z\,\mathbf{k}$ and s is the upper half of the sphere $x^2+y^2+z^2=a^2$ and $z\geq0$
			(OR)
CO5	K5	20b.	Justify Gauss divergence theorem for the function $f=y\mathbf{i}+x\mathbf{j}+z^2\mathbf{k}$ for the cylindrical region S is given by $x^2+y^2=a^2$, z=0 and z=h