

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF MATHEMATICS
18MAB102T – ADVANCED CALCULUS AND COMPLEX ANALYSIS (2021 -2022 EVEN)

MODULE – 2 : VECTOR CALCULUS

TUTORIAL SHEET – II

S.No.	Questions	Answers
Part - A		
1	If $\vec{F} = 3xy\vec{i} - y^2\vec{j}$, evaluate $\int_C \vec{F} \cdot d\vec{r}$, where C is curve in the xy plane $y = 2x^2$, from (0, 0) to (1, 2).	$-\frac{7}{6}$
2	Determine where $\vec{F} = (2xy + z^2)\vec{i} + x^2\vec{j} + 3xz^2\vec{k}$ is a conservative force field.	\vec{F} is not conservative field.
3	Find the work done in moving a particle in the force field $\vec{F} = 3x^2\vec{i} + (2xz - y)\vec{j} - z\vec{k}$ from $t = 0$ to $t = 1$ along the curve $x = 2t^2$, $y = t$, $z = 4t^3$.	$\frac{13}{6}$
4	Evaluate $\int_C x dy - y dx$, where C is the circle $x^2 + y^2 = 4$.	8π
5	Use divergence theorem evaluate $\iint_S \nabla \cdot \vec{r} \cdot \hat{n} dS$	6V
Part - B		
6	If $\vec{F} = (4xy - 3x^2z^2)\vec{i} + 2x^2\vec{j} - 2x^3z\vec{k}$, check whether the integral $\int_C \vec{F} \cdot d\vec{r}$ is independent of the path C.	The line integral is independent of the path C.
7	Find the work done when a force $\vec{F} = (y + 3)\vec{i} + xz\vec{j} + (yz - x)\vec{k}$ moves a particle from (0, 0, 0) to the point (2, 1, 1) along the curve $x = 2t^2$, $y = t$, $z = t^3$	$\frac{724}{105}$
8	Evaluate $\iint_S \vec{F} \cdot \hat{n} dS$ where $\vec{F} = z\vec{i} + x\vec{j} - y^2z\vec{k}$ and S is the surface of the cylinder $x^2 + y^2 = 1$, included in the first octant between the planes $z = 0$ and $z = 2$.	3
9	Evaluate $\iint_S \vec{F} \cdot \hat{n} dS$ where $\vec{F} = yz\vec{i} + zx\vec{j} + xy\vec{k}$ and S is that part of the surface of the sphere $x^2 + y^2 + z^2 = 1$, which lies in the first octant.	$\frac{3}{8}$
10	If $\vec{F} = (2x^2 - 3z)\vec{i} - 2xy\vec{j} - 4x\vec{k}$, evaluate $\iiint_V \nabla \times \vec{F} dV$ where V is the region bounded by $x = 0$, $y = 0$, $z = 0$ and $2x + 2y + z = 4$.	$\frac{8}{3}(\vec{j} - \vec{k})$