

SRM Institute of Science and Technology
Department of Mathematics
18MAB102T-Advanced Calculus and Complex Analysis
2020-2021 Even
Unit – II: Vector Calculus
Tutorial Sheet - III

S.No	Questions	Answers
Part – A [3 Marks]		
1	Evaluate $\int_C (x^2 + xy) dx + (x^2 + y^2) dy$ where C is the square formed by the lines $x = \pm 1, y = \pm 1$.	0
2	Evaluate $\oint_C \vec{F} \cdot d\vec{r}$ by stoke's theorem where $\vec{F} = y^2 \vec{i} + x^2 \vec{j} - (x+z) \vec{k}$, and C is the boundary of the triangle with vertices at (0,0,0), (1,0,0), (1,1,0).	$\frac{1}{3}$
3	Evaluate $\oint_C (xy dx + xy^2 dy)$ by stoke's theorem where C is the square in the x-y plane with vertices (1,0), (-1,0), (0,1), (0,-1)	$\frac{4}{3}$
4	Evaluate $\iiint_V \phi dv$, where $\phi = 45x^2y$ and V is the closed origin bounded by the planes $4x + 2y + z = 8, x = 0, y = 0, z = 0$.	128
5	If $\vec{F} = (2x^2 - 3z) \vec{i} - 2xy \vec{j} - 4x \vec{k}$, then evaluate $\iiint_V \nabla \cdot \vec{F} dv$, where V is bounded by the planes $x = 0, y = 0, z = 0$ and $2x + 2y + z = 4$.	$\frac{8}{3}$
Part – B [6 Marks]		
6	Verify Stoke's theorem for the function $\vec{F} = x^2 \vec{i} + xy \vec{j}$, integrated round the square in the $z = 0$ plane whose sides are along the lines $x = 0, y = 0, x = a, y = a$	$\frac{a^3}{2}$
7	Verify Stoke's theorem for $\vec{F} = (x^2 + y^2) \vec{i} - 2xy \vec{j}$, taken round the rectangle bounded by $x = \pm a, y = 0, y = b$	$-4ab^2$
8	Verify Stoke's theorem for $\vec{F} = (y - z + 2) \vec{i} - (yz + 4) \vec{j} - (xz) \vec{k}$, over the surface of a cube $x = 0, y = 0, z = 0, x = 2, y = 2, z = 2$ above the XOY plane.	-4
9	Verify divergence theorem for $\vec{F} = (x^2 - yz) \vec{i} + (y^2 - zx) \vec{j} + (z^2 - xy) \vec{k}$, taken over the rectangular parallelepiped $0 \leq x \leq a, 0 \leq y \leq b, 0 \leq z \leq c$.	abc (a+b+c)
10	Verify divergence theorem for the function $\vec{F} = 4xz \vec{i} - y^2 \vec{j} + yz \vec{k}$, taken over the cube bounded by the planes $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$.	$\frac{3}{2}$