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

S.No.	Questions	Answers
	Part – A [3 Marks]	
1	Evaluate $\int_C \vec{F}.\vec{dr}$, where $\vec{F} = x^2\vec{i} + y^3\vec{j}$ and curve C is the arc of the parabola $y = x^2$ in the x-y plane from (0,0) to (1,1).	$\frac{7}{12}$
2	Show that $\vec{F} = (2xy + z^3)\vec{i} - x^2\vec{j} + 3xz^2\vec{k}$ is a conservative force field .	0
3	Find the total work done in moving a particle in a force field given by $\vec{F} = 3xy\vec{i} - 5z\vec{j} + 10x\vec{k}$ along the curve $x = t^2 + 1, y = 2t^2, z = t^3$ from t = 1 to t = 2.	303
4	Using Green's theorem, evaluate $\int_C (x^2 - y^2)\,dx + 2xy\,dy$ Where C is the closed curve of the region bounded by $y = x^2$ and $y^2 = x$.	$\frac{3}{5}$
5	Evaluate $\iint_S \vec{A}.n\,ds$, Where $\vec{A} = (x + y^2)\vec{i} - 2x\vec{j} + 2yz\vec{k}$ and S is the surface of the plane 2x + y + 2z = 6 in the first octant.	81
	Part – B [6 Marks]	
6	If $\vec{F} = (3x^2 + 6y)\vec{i} - 14yz\vec{j} + 20xz^2\vec{k}$. Evaluate $\int_C \vec{F}.\vec{dr}$, from (0,0,0) to (1,1,1) along the curve $x = t, y = t^2, z = t^3$.	5
7	Verify Green's theorem in the plane for $\oint_C (3x^2 - 8y^2)\,dx + (4y - 6xy)\,dy$, where C is the boundary of the region defined by $i)\; x = 0,\; y = 0,\; x + y = 1$ *and* $ii)\; y = \sqrt{x}, y = x^2$	$i)\frac{5}{3}$ $ii)\frac{3}{2}$
8	Verify Green's theorem in the plane for $\oint_C (xy + y^2)\,dx + x^2\,dy$, where C is the boundary of the region defined by $y = x,\; y = x^2$	$-\frac{1}{20}$
9	Find $\int_C (x^2 + y^2)\,dx - 2xy\,dy$ and the curve C is the rectangle in x-y plane bounded by $x = 0,\; x = a,\; y = 0, y = b$	$-2ab^2$
10	Evaluate $\iint_S \vec{A}.n\,ds$, Where $\vec{A} = yz\vec{i} + zx\vec{j} + xy\vec{k}$ and S is the surface of the sphere $x^2 + y^2 + z^2 = 1$, which lies in the first octant.	$\frac{3}{8}$ *sq.units*