All Branches Hinglish

Subject : Engineering Mathematics

DPP-04

Chapter : Vector Calculus

Topic : Line, surface & Volume Integral, Stokes, Green & Gauss Divergence Theorem

1. The line integral $\int \bar{V} \cdot d\,\bar{r}$ of the vector $\vec{V} = 2xyz\hat{i} + x^2 z\hat{j} + x^2 y\hat{k}$ from the origin of the point (1, 1, 1)

(a) is 1
(b) is zero
(c) is –1
(d) cannot be determined without specifying the path

2. Value of the integral $\oint_c (xy\,dy - y^2 dx)$, where C is the square cut from the first quadrant by the lines x = 1 and y = 1 will be (use Green's theorem to change the line integral into double integral)

(a) 1/2 (b) 1
(c) 3/2 (d) 5/3

3. Consider points P and Q in the x-y plane, with P = (1,0) and Q = (0, 1). The line integral $2\int_P^Q \left(xdx + ydy\right)$ along the semicircle with the line segment PQ as its diameter

(a) is –1
(b) is 0
(c) is 1
(d) depends on the direction (clockwise or anti-clockwise of the semi-circle)

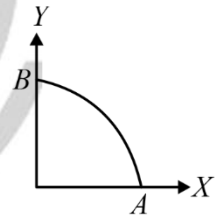
4. If $\bar{r}$ is the position vector of any point on a closed surface S that encloses the volume V then $\iint_S \left(\bar{r} \cdot d\,\bar{s}\right)$ is equal to

(a) $\frac{1}{2}$V (b) V
(c) 2V (d) 3V

5. $F(x,y) = \left(x^2 + xy\right)\hat{a}_x + \left(y^2 + xy\right)\hat{a}_y$. It's line integral over the straight line from (x, y) = (0,2) to (2,0) evaluate to

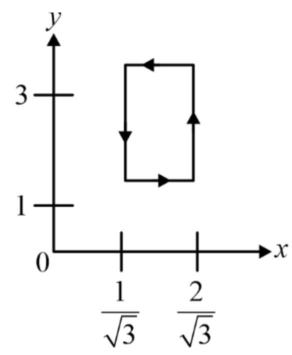
(a) –8 (b) 4
(c) 8 (d) 0

6. A path AB in the form of one quarter of a circle of unit radius is shown in the figure. Integration of $(x + y)^2$ on path AB traversed in counter-clockwise sense is



(a) $\frac{\pi}{2} - 1$ (b) $\frac{\pi}{2} + 1$
(c) $\frac{\pi}{2}$ (d) 1

7. If $\vec{A} = xy\hat{a}_x + x^2\hat{a}_y$, $\oint_C \vec{A} \cdot \vec{dl}$ over the path shown in the figure is



(a) 0 (b) $\frac{2}{\sqrt{3}}$

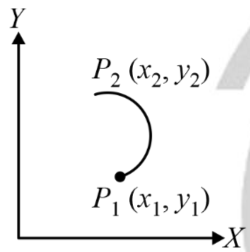
(c) 1 (d) $2\sqrt{3}$

8. The line integral of the vector function $\bar{F} = 2x\hat{i} + x^2\hat{j}$ along the x-axis from $x = 1$ to $x = 2$ is

(a) 0 (b) 2.33

(c) 3 (d) 5.33

9. The line integral $\int_{P_1}^{P_2} (y\,dx + x\,dy)$ from P_1 (x_1, y_1) to $P_2(x_2, y_2)$ along the semi-circle P_1P_2 shown in the figure is



(a) $x_2 y_2 - x_1 y_1$ (b) $(y_2^2 - y_1^2) + (x_2^2 - x_1^2)$

(c) $(x_2 - x_1)(y_2 - y_1)$ (d) $(y_2 - y_1)^2 + (x_2 - x_1)^2$

10. The area of the triangle formed by the tips of vectors $\bar{a}, \bar{b}$ and $\bar{c}$ is

(a) $\frac{1}{2}(a-b)\cdot(a-c)$

(b) $\frac{1}{2}\left|(a-b)\times(a-c)\right|$

(c) $\frac{1}{2}\left|a\times b\times c\right|$

(d) $\frac{1}{2}(a\times b)\cdot c$

11. Consider a close surface S surrounding volume V. If $\vec{r}$ is the position vector of a point inside S, with $\hat{n}$ the unit normal on S the value of the integral $\iint_S 5\vec{r}\cdot\hat{n}\,dS$ is

(a) 3 V (b) 5 V

(c) 10 V (d) 15 V

12. The line integral of function $F = yz\hat{\imath}$, in the counter clockwise direction, along the circle $x^2 + y^2 = 1$ at $z = 1$ is

(a) -2π (b) $-\pi$

(c) π (d) 2π

Answer Key

1. (a)
2. (c)
3. (b)
4. (d)
5. (d)
6. (b)
7. (c)
8. (c)
9. (a)
10. (b)
11. (d)
12. (b)