# All Branches Hinglish

## Subject: Engineering Mathematics

**DPP-03**

## Chapter: Vector Calculus

### Topic: Divergence & Curl of Vector Function , Line, surface & Volume Integral

**1.** Curl of vector $\vec{v}(x,y,z) = 2x^2\hat{i} + 3z^2\hat{j} + y^3\hat{k}$ at $x = y = z = 1$ is

(a) $-3i$ (b) $3i$
(c) $3i - 4j$ (d) $3i - 6k$

**2.** If $\vec{r} = x\hat{a}_x + y\hat{a}_y + z\hat{a}_z$ and $|\vec{r}| = r$, then div $(r^2\nabla(\ln r))$ = ____.

**3.** A vectror $\vec{P}$ is given by $\vec{P} = x^3y\vec{a}_x - x^2y^2\vec{a}_y - x^2yz\vec{a}_z$. Which one of the following statements is TRUE?

(a) $\vec{P}$ is solenoidal, but not irrotational
(b) $\vec{P}$ is irrotational, but not solenoidal
(c) $\vec{P}$ is neither solenoidal nor irrotational
(d) $\vec{P}$ is both solenoidal and irrotational

**4.** The velocity field of an incompressible flow is given by
$V = (a_1x + a_2y + a_3z)\hat{i} + (b_1x + b_2y + b_3z)\hat{j}$
$+ (c_1x + c_2y + c_3z)\hat{k}$
and $a_1 = 2$ & $c_3 = -4$. The value of $b_2$ is ______.

**5.** $\nabla \times \nabla \times P$ (where $P$ is a vector) is equal to

(a) $P \times \nabla \times P - \nabla^2 P$
(b) $\nabla^2 P + \nabla(\nabla \times P)$
(c) $\nabla^2 P + \nabla \times P$
(d) $\nabla(\nabla \bullet P) - \nabla^2 P$

**6.** The curl of vector $A = e^{xy}\, i + \sin xyj + \cos^2 xzk$ is

(a) $ye^{xy}\, i + x \cos xy\, j - 2x\sin 2xz\, k$
(b) $z\sin 2xzi + (y \cos xy - xe^{xy})k$
(c) $z\sin 2xzi + (x \cos xy - xe^{xy})k$
(d) $xye^{xy}\, i + xy \cos xyj - 2xz\sin 2xzk$

**7.** If $A = (3y^2 - 2z)i - 2x^2 zj + (x + 2y)k$, the value of $\nabla \times \nabla \times A$ at $P(-2, 3, -1)$ is

(a) $-(6i + 4j)$ (b) $8(i + j)$
(c) $-8(i + j)$ (d) 0

**8.** The directional derivative of function $\Phi = xy + yz + zx$ at point $P$ (3, –3, –3) in the direction toward point $Q$ (4, –1, –1) is

(a) –3 (b) 1
(c) – 2 (d) 0

**9.** The maximum value of the directional derivative of the function $\phi = 2x^3 + 3y^2 + 5z^2$ at a point (1, 1, –1) is

(a) 10 (b) – 4
(c) $\sqrt{152}$ (d) 152

**10.** The grad. $\nabla \times A$ of a vector field $A = x^2 yi + y^2 zj - 2xzk$ is

(a) $2xy + 2yz - 2x$
(b) $x^2 y + y^2 z - 2xz$
(c) $2x^2 y + 2y^2 z - 2xz$
(d) 0

# Answer Key

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