

## Unit 4 - Week 3

### Course outline

How does an NPTEL online course work?

#### Week 1

#### Week 2

#### Week 3

- Curvilinear coordinates: Cartesian vs. Polar
- Generic curvilinear coordinate systems: Unit vectors and components
- Differential vector calculus in curvilinear coordinate systems
- Special curvilinear coordinate systems: Cylindrical and spherical
- Vector calculus in spherical coordinate system
- Vector calculus in cylindrical coordinate system
- Introduction to Dirac delta function
- Week 3 Practice Assignment
- Quiz : Assignment 3
- Week 3 Feedback : Electromagnetism

#### Week 4

#### Week 5

#### Week 6

#### Week 7

#### Week 8

#### Week 9

#### Week 10

#### Week 11

#### Week 12

#### Download Videos

#### Lecture materials

## Assignment 3

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

**Due on 2020-02-19, 23:59 IST.**

### Divergence in spherical coordinate system.

A vector field  $\vec{v}$  is expressed in spherical coordinate system as

$$\vec{v} = (r\cos\theta)\hat{r} + (r\sin\theta)\hat{\theta} + (r\sin\theta\cos\phi)\hat{\phi}$$

1)  $\vec{\nabla} \cdot \vec{v}$  is

$$r \cos\theta - \sin\phi$$

$$r \cos\theta + r \sin\phi$$

$$5 \cos\theta - \sin\phi$$

$$5 \cos\theta + \sin\phi$$

No, the answer is incorrect. Score: 0

Accepted Answers:  $5 \cos\theta - \sin\phi$

2) The surface integral  $\oint_S \vec{v} \cdot d\vec{a}$  over the surface of an inverted hemispherical bowl of radius  $R$ , resting on the  $xy$  plane and centered at the origin **4 points**

is

$$\frac{5}{4}\pi R^2$$

$$\frac{5}{3}\pi R^2$$

$$\frac{5}{4}\pi R^4$$

$$\frac{5}{3}\pi R^3$$

No, the answer is incorrect. Score: 0

Accepted Answers:  $\frac{5}{3}\pi R^3$

### Cylindrical coordinate system

A vector  $\vec{v}$  is given in cylindrical coordinate system as

$$\vec{v} = s(2 + \sin^2\phi)\hat{s} + s \sin\theta \cos\phi \hat{\phi} + 3z\hat{z}.$$

3)  $\vec{\nabla} \cdot \vec{v}$  is

 7
 8
 9
 10

No, the answer is incorrect. Score: 0

Accepted Answers: 8

4)  $\vec{\nabla} \times \vec{v}$  is

 7
 8
 9
 0

No, the answer is incorrect. Score: 0

Accepted Answers: 0

### Dirac delta function

Choose the correct options for the following integrals involving the Dirac delta function:

5)  $\int_2^6 (3x^2 - 2x - 1) \delta(x - 3) dx$

 20
 16
 14
 8

No, the answer is incorrect. Score: 0

Accepted Answers: 20

6)  $\int_0^5 \cos x \delta(x - \pi) dx$

 1
 -1
 2
  $\pi$ 

No, the answer is incorrect. Score: 0

Accepted Answers: -1

7)  $\int_0^3 x^3 \delta(x + 1) dx$

 0
 1
 -1
 3

No, the answer is incorrect. Score: 0

Accepted Answers: 0

8)  $\int_{-\infty}^{\infty} \ln(x + 3) \delta(x + 2) dx$

 1
 2
 0.005
 0

No, the answer is incorrect. Score: 0

Accepted Answers: 0

2 points

4 points

2 points

2 points

2 points

2 points

2 points

2 points