

Unit 10 - Week 9

Course outline

How does an NPTEL online course work?

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Motion of a charged particle in electromagnetic field

Work done by a magnetic field

Electric current

Surface and volume current

Biot Savart law

Biot Savart law with surface and volume currents

A tutorial on currents and magnetic field

Quiz : Assignment 9

Week 9 Feedback : Electromagnetism

Week 10

Week 11

Week 12

Download Videos

Lecture materials

Assignment 9

The due date for submitting this assignment has passed. **Due on 2020-04-01, 23:59 IST.**
As per our records you have not submitted this assignment.

Currents

A current I flows down a wire of radius a .

1) If it is uniformly distributed over the surface, what is the surface current density K ? **4 points**

$$K = I / \pi a^2$$

$$K = 3I / \pi a^2$$

$$K = I / 2\pi a$$

$$K = I / \pi a$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $K = I / 2\pi a$

2) If it is distributed in such a way that the volume current density is inversely proportional to the distance from the axis (s), what is J ? **5 points**

$$J = \frac{I}{2\pi a s}$$

$$J = \frac{I}{2\pi a}$$

$$J = \frac{3I}{4\pi a s}$$

$$J = \frac{I}{\pi a s}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $J = \frac{I}{2\pi a s}$

3) Suppose that the magnetic field in some region has the form $\vec{B} = kz\hat{x}$ (where k is a constant). Find the force on a square loop (side a), lying in the yz plane and centered at the origin, if it carries a current I , flowing counterclockwise, when you look down the x axis. **5 points**

$$F = Ika\hat{z}$$

$$F = ka^2\hat{z}$$

$$F = Ika^2\hat{z}$$

$$F = ka^3\hat{z}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $F = Ika^2\hat{z}$

Biot-Savart Law

4) Find the magnetic field at the center of a square loop, which carries a steady current I . Let R be the distance from center to side. **4 points**

$$B = \frac{\sqrt{2}\mu_0 I}{\pi R}$$

$$B = \frac{\sqrt{2}\mu_0}{\pi R}$$

$$B = \frac{2\mu_0 I}{\pi R}$$

$$B = \frac{\sqrt{3}\mu_0 I}{\pi R}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $B = \frac{\sqrt{2}\mu_0 I}{\pi R}$

5) Find the field at the center of a regular n -sided polygon, carrying a steady current I . Again, let R be the distance from the center to any side. **5 points**

$$B = \frac{n\mu_0 I}{2\pi R} \cos(\pi/n)$$

$$B = \frac{n\mu_0 I}{2\pi R} \sin(\pi/n)$$

$$B = \frac{\mu_0 I}{2\pi} \sin(\pi/n)$$

$$B = \frac{\mu_0 I}{2\pi R} \sin(2\pi/n)$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $B = \frac{n\mu_0 I}{2\pi R} \sin(\pi/n)$