# Unit 13 - Week 12



## Assignment 12

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

**Due on 2020-04-22, 23:59 IST.**

1) **Inductance** *6 points*

Find the self-inductance per unit length of a long solenoid, of radius $R$, carrying $n$ turns per unit length.

- $L = \mu_0 \pi n^2 R^2$
- $L = \mu_0 \pi n R$
- $L = \mu_0 2\pi R$
- $L = \mu_0 n R$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$L = \mu_0 \pi n^2 R^2$

2) *6 points*

A long solenoid, of radius $a$, is driven by an alternating current, so that the field inside is sinusoidal: $\vec{B}(t) = B_0 cos(\omega t)\hat{z}$.
A circular loop of wire, of radius $a/2$ and resistance $R$, is placed inside the solenoid, and coaxial with it. Find the current induced in the loop, as a function of time.

- $I(t) = \frac{\pi a}{4R} B_0 sin(\omega t)$
- $I(t) = \frac{\pi a^2 \omega}{4R} B_0 cos(\omega t)$
- $I(t) = \frac{\pi a^2 \omega}{4R} B_0 sin(\omega t)$
- $I(t) = \frac{\pi a \omega}{R} B_0 sin(\omega t)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$I(t) = \frac{\pi a^2 \omega}{4R} B_0 sin(\omega t)$

3) A long cable carries current in one direction uniformly distributed over its (circular) cross section. The current returns along the surface (there is a very thin insulating sheath separating the currents). Find the self-inductance per unit length. *6 points*

- $L/l = \frac{\mu_0}{4\pi}$
- $L/l = \frac{\mu_0}{8\pi}$
- $L/l = \frac{\mu_0}{16\pi}$
- $L/l = \frac{\mu_0}{2\pi}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$L/l = \frac{\mu_0}{8\pi}$