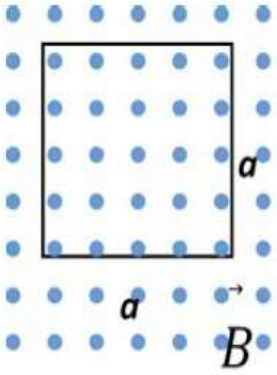
FİZ 138 – 25

2ND MIDTERM - ANSWERS

A time varying magnetic field is applied to a single turn square coil with one edge length a, as shown in figure. If the magnetic field is $B(t)=B_o t^2+b$. If the resistance of the coil is R, which of the followings gives the magnitude and direction of the current induced in the coil?



Lütfen birini seçin:

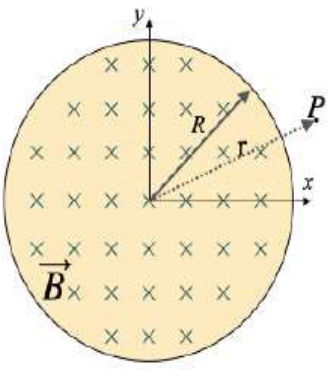
- A. $2a(B_oRt)$ (CW)
- B. $a^2(2B_ot+b)/R$ (CCW)
- C. $a^2(B_ot+b)R$ (CCW)
- D. $(2/R)a^2B_ot$ (CW) ◉
- E. $2a(2B_ot+b)R$ (CW)

A toroidal inductor with an inductance of 280 mH encloses a volume of 0.2 m^3. If the average energy density in the toroid is 70 J/m^3, what is the current (in A) through the inductor?

Lütfen birini seçin:

- A. 450
- B. 2200
- C. 120
- D. 15
- E. 10 ◉

Figure shows a uniform magnetic field confined to a cylindrical volume of radius R = 8 cm. The magnitude of magnetic field is decreasing at a constant rate of 20 mT/s. Calculate the magnitude of the induced electric field (in mV/m) at r = 10 cm from its center.



Lütfen birini seçin:

- A. 0.96
- B. 0.20
- C. 18
- D. 60
- E. 0.64 ◉

A 900-turn coil, with a dipole moment of 12 T.m/A, has a current of 150 mA. By an external agent, this coil is rotated randomly in a strong magnetic field of 2.5 T. Calculate the *maximum* change in potential energy (in J) of the system.

Lütfen birini seçin:

- (●) A. 60
- ( ) B. 1620
- ( ) C. 120
- ( ) D. 0.45
- ( ) E. 0.08

The mass of 40 cm straight, horizontal copper wire is 650 grams. A perpendicular magnetic field of 200 mT is applied to the wire. If a steady current of 30 A flows on the wire, what is the magnitude of the magnetic force (in N)?

Lütfen birini seçin:

- ( ) A. 50
- ( ) B. 350
- ( ) C. 1200
- ( ) D. 34
- (●) E. 2.4

A *20-turn* circular coil with cross sectional area of $5x10^{-3}$ m^2 is made by a copper wire of diameter of *0.3 mm*. While a constant current of *100 μA* is flowing through the coil, an external magnetic field is applied with magnitude *0.3 T*. Calculate the *maximum magnitude* of the torque (in *N.m)* on the loop from the magnetic field?

Lütfen birini seçin:

- ( ) A. $1.5x10^{-5}$
- (●) B. $3x10^{-6}$
- ( ) C. $1X10^{-5}$
- ( ) D. $9x10^{-10}$
- ( ) E. $4x10^{-4}$

Assume a positive charge is tracing a circle, with the effect of a magnetic field. Which of the followings helps the charge make *smaller circles*?

Lütfen birini seçin:

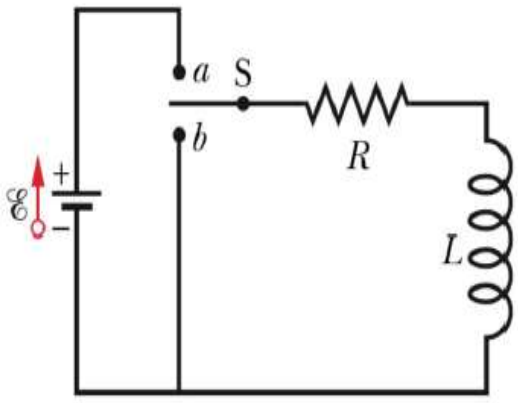
- A. Increasing the velocity of the charge.
- B. Increasing the magnitude of the charge
- C. Making the magnetic field parallel to the velocity.
- D. Decreasing the magnitude of the magnetic field.
- E. Doubling the mass of the charge.

A wire loop of radius 8 cm and resistance 8 Ω is located in a uniform magnetic field of 0.50 T. If the magnetic field is decreased to zero in 30 ms, calculate the magnitude of induced current (in mA) in the loop.

Lütfen birini seçin:

- A. 40
- B. 820
- C. 94
- D. 64
- E. 240

A series RL circuit is built as given in the figure, where the inductance is L = 50 mH, resistance is R = 0.25 Ω and the emf is ε = 20 V. The switch S is thrown to the position *a*. How much energy (in J), is stored in the magnetic field after the current has built up to its equilibrium value?



Lütfen birini seçin:

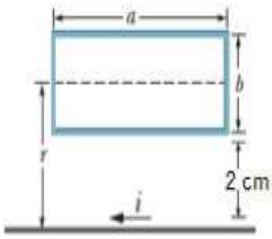
- A. 1.6×10^2
- B. 2.0
- C. 0.25
- D. 1.2×10^2
- E. 0

An 8 mH inductor and a 2.0 Ω resistor are wired in series to a 20 V ideal battery. A switch in the circuit is closed at time t=0, when the current is zero. Find the current (in A) in the resistor after a long time.

Lütfen birini seçin:

- A. 20
- B. 2.5
- C. 8
- D. 10
- E. 0

In figure a rectangular loop of wire with length a = 4 cm, width b = 2 cm is placed near an infinitely long wire carrying steady current 5.1 A. What is the magnetic flux through the loop?



Lütfen birini seçin:

- A. 2.6×10^{-7}
- B. 0.1×10^{-7}
- C. 2.8×10^{-8}
- D. 8.8×10^{-8}
- E. 0.6×10^{-8}

A toroid has a square cross section with the length of an edge equal to the radius of the inner surface. The ratio of the magnitude of the magnetic field at the inner surface to the magnitude of the field at the outer surface is:

Lütfen birini seçin:

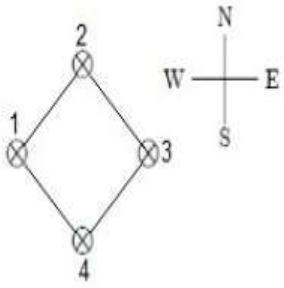
- A. 2
- B. 1
- C. 1/4
- D. 4
- E. 1/2

The current density J inside a long, solid, cylindrical wire of radius R = 3 cm is in the direction of the central axis, and its magnitude varies with radial distance *r* from the axis according to $J=(4x10^5)r^2$. Find the magnitude of the magnetic field (in μT) at a point r = 2 cm from the axis of the wire?

Lütfen birini seçin:

- A. 0.26
- B. 0.60
- C. 1.2
- D. 0.96
- E. 0.82

Four long straight wires that are placed at the corners of a square carry equal currents into the page as shown in the figure. Find the magnetic force exerted on the **wire-1**.



Lütfen birini seçin:

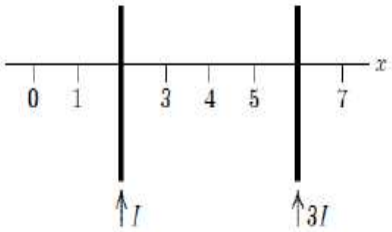
- A. South of East
- B. East of North
- C. East
- D. West
- E. North

Two long straight wires enter a room through a door. One carries a current oF 3.0 A into the room while the other carries a current of 5.0 A out. The magnitude of the path integral $\oint \vec{B}.\vec{ds}$ (in μT.m) around the door frame is:

Lütfen birini seçin:

- A. 1.0
- B. 3.8
- C. 2.4
- D. 8.4
- E. 6.3

Two long straight current-carrying parallel wires cross the x-axis and carry currents I and 3I in the same direction, as shown in the figure. At which point along x is the net magnetic field zero?



Lütfen birini seçin:

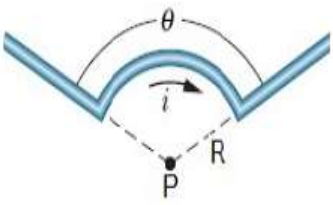
- A. 7
- B. 3
- C. 5
- D. 0
- E. 1

Two parallel long wires carry the same magnitude of current and repel each other with a force F per unit length L. If both these currents are *doubled* and the wire separation is *tripled*, the force per unit length (in N/m) becomes:

Lütfen birini seçin:

- A. 6F
- B. 4F/3
- C. 4F/9
- D. 2F/9
- E. 2F/3

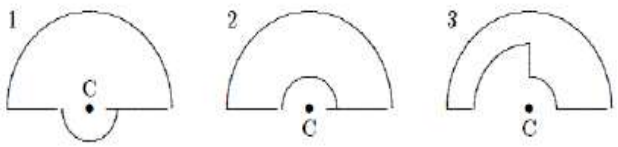
The segment of wire in the figure carries a current i = 30 A, where the radius of the circular arc is R = 40 cm. Determine the magnitude of the magnetic field (in μT) at the origin if θ=120º.



Lütfen birini seçin:

- A. 45 (out of page)
- B. 25 (into page)
- C. 15 (into page)
- D. 0
- E. 10 (out of page)

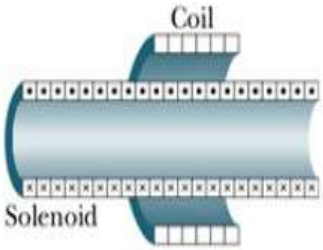
The diagrams show three circuits consisting of concentric circular arcs (either half or quarter circles of radii r, 2r, and 3r) and radial lengths. The circuits carry the same current. Rank them according to the magnitudes of the magnetic fields they produce at C, least to greatest.



Lütfen birini seçin:

- A. 2, 3, 1
- B. 1, 3, 2
- C. 3, 2, 1
- D. 1, 2, 3
- E. 2, 1, 3

A 4000-turn coil of radius 3 cm and resistance R=150 Ω is coaxial with a solenoid of 100 turns/cm and diameter 2 cm. The solenoid current drops from 15 A to zero in time interval of 30 ms. What is the induced emf (in V) in the coil during that time?



Lütfen birini seçin:

- A. 88
- B. 7.2
- C. 0.10
- D. 4.5
- E. 18