

FINAL EXAM

T-032

- 1 Q0 A string 180 cm long has a fundamental frequency of vibration
17 Q0 of 300 Hz. What length of the same string, under the same
Q0 tension, will have a fundamental frequency of 200 Hz?
Q0
A1 270 cm.
A2 147 cm.
A3 120 cm.
A4 220 cm.
A5 900 cm.
Q0
- 2 Q0 A point source emits 30 W of sound. A small microphone
18 Q0 has an area of 0.75 cm^2 is placed 10 m from the point
Q0 source. What power does the microphone receive?
Q0
A1 1.8 micro-W.
A2 3.6 micro-W.
A3 0.1 micro-W.
A4 9.3 micro-W.
A5 30 micro-W.
Q0
- 3 Q0 A closed tank, at room temperature, has a mixture of hydrogen
19 Q0 molecules and helium atoms. The ratio of rms speed of
Q0 hydrogen molecules to that of helium is:
Q0 [Note: The molar mass of the hydrogen molecule is 2.0 g/mol
Q0 and the molar mass of the helium atom is 4.0 g/mol]
Q0
A1 1.4
A2 2.1
A3 3.2
A4 0.1
A5 0.3
Q0
- 4 Q0 A Carnot engine has an efficiency of 20%. It operates between
21 Q0 two constant-temperature reservoirs differing in temperature
Q0 by 70.0 K. What is the temperature of the HOT reservoir?
Q0
A1 350 K.
A2 280 K.
A3 300 K.
A4 400 K.
A5 70 K.
Q0
- 5 Q0 In figure (1), if $Q = 30 \text{ micro-C}$, $q = 5.0 \text{ micro-C}$ and $d = 0.3 \text{ m}$,
22 Q0 find the net force on q . [i and j are the unit vectors in the
Q0 positive direction of x-axis and y-axis, respectively].
Q0
A1 zero.
A2 $7.5 i \text{ (N)}$.
A3 $-7.5 i \text{ (N)}$.
A4 $-3.8 j \text{ (N)}$.
A5 $3.8 i \text{ (N)}$.
Q0
- 6 Q0 A metallic sphere, in electrostatic equilibrium, has a

- Q0 radius R and carries a net charge Q . Which of the following
- 25 Q0 statements are true for the sphere?
- Q0
- Q0 i- It is made of a non-conducting material.
- Q0 ii- The excess charge resides on its surface.
- Q0 iii- The electric field inside it is zero.
- Q0 iv- The electric potential inside it is constant.
- Q0
- A1 ii, iii, and iv only.
- A2 i and ii only.
- A3 i, ii, and iii only.
- A4 iii, and iv only.
- A5 i, ii, and iv only.
- Q0
- 7 Q0 The electric field 20 mm from a certain point charge has
- 23 Q0 a magnitude $|E|$. The magnitude of the electric field
- Q0 10 mm from the point charge is
- Q0
- A1 $4.0*|E|$.
- A2 $2.0*|E|$.
- A3 $1.5*|E|$.
- A4 $6.0*|E|$.
- A5 zero.
- Q0
- 8 Q0 In figure (2), find the charge stored by the capacitor C3
- Q0 if the potential difference across the battery is 10.0 V.
- 26 Q0 Use the values $C1 = C2 = 2.0$ micro-F and $C3 = 4.00$ micro-F.
- Q0
- A1 20 micro-C.
- A2 10 micro-C.
- A3 15 micro-C.
- A4 30 micro-C.
- A5 99 micro-C.
- Q0
- 9 Q0 Two concentric spherical shells of radii 10 cm and 5.0 cm
- 26 Q0 are charged to a potential difference of 20 V. How
- Q0 much energy is stored in this spherical capacitor?
- Q0
- A1 $2.2*10^{(-9)}$ J.
- A2 $1.3*10^{(-9)}$ J.
- A3 $3.1*10^{(-7)}$ J.
- A4 $5.4*10^{(-9)}$ J .
- A5 $9.8*10^{(-8)}$ J .
- Q0
- 10 Q0 A parallel-plate air-filled capacitor, of area 25 cm^2 and
- 26 Q0 plate separation of 1.0 mm, is charged to a potential
- Q0 difference of 600 V. Find the energy density between
- Q0 the plates.
- Q0
- A1 1.6 J/m^3 .
- A2 0.3 J/m^3 .
- A3 7.4 J/m^3 .
- A4 3.2 J/m^3 .
- A5 1.9 J/m^3 .
- Q0
- 11 Q0 A parallel-plate capacitor has an area A and a separation d .
- Q0 Find its capacitance if it is filled with two dielectrics as

- 26 Q0 shown in figure 3. [C_0 is the capacitance of the air-filled parallel-plate capacitor. $K_1 = 3$ and $K_2 = 1.5$ are the dielectric constants]
- Q0
- A1 $2 \cdot C_0$.
- A2 $6 \cdot C_0$.
- A3 $3 \cdot C_0$.
- A4 $4 \cdot C_0$.
- A5 C_0 .
- Q0
- 12 Q0 A 20% increase in the resistance of a copper wire was noticed
- 27 Q0 when its temperature was raised above room temperature. Find the final temperature of the wire if the temperature coefficient of resistivity for copper is $4.0 \cdot 10^{-3} /K$.
- Q0 [Assume the room temperature = 290 K]
- Q0
- A1 340 K.
- A2 351 K.
- A3 300 K.
- A4 322 K.
- A5 999 K.
- Q0
- 13 Q0 A potential difference of 9.0 V is applied across the length of a cylindrical conductor with radius 2.0 mm. Calculate the
- 27 Q0 current density if the conductor has a resistance of 90 ohms.
- Q0
- A1 $8.0 \cdot 10^{-3} \text{ A/m}^2$.
- A2 $5.0 \cdot 10^{-3} \text{ A/m}^2$.
- A3 $6.0 \cdot 10^{-3} \text{ A/m}^2$.
- A4 $2.0 \cdot 10^{-3} \text{ A/m}^2$.
- A5 $2.3 \cdot 10^{-7} \text{ A/m}^2$.
- Q0
- 14 Q0 A current of 5.0 A exists in a 10 ohms resistor for 5.0 min.
- 27 Q0 How many electrons pass through any cross section of the resistor in this time?
- Q0
- A1 $9.4 \cdot 10^{21}$
- A2 $6.1 \cdot 10^{23}$
- A3 $1.2 \cdot 10^{21}$
- A4 $3.3 \cdot 10^{22}$
- A5 $7.8 \cdot 10^{21}$
- Q0
- 15 Q0 A 6-V battery supplies a total of 48 W to two identical
- 28 Q0 light bulbs connected in parallel. The resistance (in ohm) of each bulb is
- Q0
- A1 1.5
- A2 0.7
- A3 3.0
- A4 4.0
- A5 1.0
- Q0
- 16 Q0 A capacitor, initially uncharged in a single-loop RC circuit, is charged to 85% of its final potential difference in 2.4 s.
- 28 Q0 What is its time constant in seconds?
- Q0
- A1 1.3

A2 1.5
A3 1.7
A4 2.8
A5 zero
Q0

17 Q0 Find the potential difference ($V_B - V_A$) between points B and
28 Q0 A of the circuit shown in figure (4)
Q0
A1 - 10 volts.
A2 10 volts.
A3 - 5 volts.
A4 5 volts.
A5 20 volts.
Q0

18 Q0 Find the value of R_1 in the circuit of figure (5)
28 Q0
Q0
A1 6.0 ohms.
A2 9.0 ohms.
A3 8.0 ohms.
A4 4.0 ohms.
A5 2.0 ohms.
Q0

19 Q0 Figure 6 shows the circular paths of an electron and a proton
29 Q0 that travel at the same speed in a uniform magnetic field B ,
Q0 which points into the page.
Q0 (a) Which particle follows the bigger circle, and
Q0 (b) does that particle travel clockwise or counterclockwise?
Q0
A1 (a) proton (b) counterclockwise
A2 (a) proton (b) clockwise
A3 (a) electron (b) counterclockwise
A4 (a) electron (b) clockwise
A5 Not enough information given.
Q0

20 Q0 In figure 7, a rectangular loop, $L_1 = 2.0$ cm by $L_2 = 3.0$ cm,
29 Q0 carrying a current $I = 0.1$ A, is suspended from a spring of
Q0 spring constant, $k = 8.0 \times 10^{(-2)}$ N/m. The loop is placed
Q0 into a uniform magnetic field, which points into the page,
Q0 and the spring is observed to stretch 1.0 cm. What is the
Q0 magnitude of the magnetic field?
Q0 [Neglect the mass of the loop]
Q0
A1 0.4 T.
A2 0.1 T.
A3 0.3 T.
A4 0.5 T.
A5 0.2 T.
Q0

21 Q0 At a point in a uniform magnetic field the acceleration of an
29 Q0 electron is 5.0×10^{14} m/s² and its speed is 7.0×10^6 m/s.
Q0 If the magnitude of the magnetic field is 1.0 mT, what is the
Q0 angle between the electron's velocity and the magnetic field?
Q0
Q0
A1 24 degrees.
A2 29 degrees.

- A3 45 degrees.
 A4 90 degrees.
 A5 zero degrees.
 Q0
- 22 Q0 A proton moves with constant velocity, $v = (8.0 \times 10^5 \text{ m/s}) \mathbf{i}$,
 29 Q0 through crossed electric and magnetic fields. If the
 Q0 magnetic field is $B = (2.5 \text{ mT}) \mathbf{j}$, what is the electric field?
 Q0 [\mathbf{i} , \mathbf{j} and \mathbf{k} are the unit vectors in the positive x, y and
 Q0 z directions, respectively].
 Q0
- A1 (-2.0 kV/m) \mathbf{k} .
 A2 (+2.0 kV/m) \mathbf{k} .
 A3 (-1.0 kV/m) \mathbf{k} .
 A4 (+1.0 kV/m) \mathbf{j} .
 A5 (-2.5 kV/m) \mathbf{i} .
 Q0
- 23 Q0 Which one of the following statements is FALSE (NOT TRUE).
 29 Q0 A uniform magnetic field
 Q0
- A1 changes the kinetic energy of a charge.
 A2 exerts a force on a moving charge.
 A3 accelerates a moving charge.
 A4 of the earth is a measurable quantity.
 A5 changes the momentum of a moving charge.
 Q0
- 24 Q0 Figure (8) shows two concentric circular loops of radii a
 Q0 and b and both carry a current I. Find the resultant
 30 Q0 magnetic field at the center of the two loops if a = 10 cm,
 Q0 b = 20 cm and I = 20 A.
 Q0
- A1 63 micro-T, out of the page.
 A2 19 micro-T, into the page.
 A3 15 micro-T, out of the page.
 A4 15 micro-T, into the page.
 A5 zero.
 Q0
- 25 Q0 Two long parallel wires, D and B, are separated by 2.0 cm.
 30 Q0 The current in D is THREE times the current in B. If the
 Q0 magnitude of the force on 2.0 m length of one of the wires
 Q0 is equal to 60 micro-N, find the current in B.
 Q0
- A1 1.0 A.
 A2 2.0 A.
 A3 1.5 A.
 A4 5.0 A.
 A5 0.5 A.
 Q0
- 26 Q0 The radius R of a long current-carrying wire is 2.3 cm. If
 30 Q0 the magnetic field at $r_1 = 2.0 \text{ cm}$ is equal to THREE times
 Q0 the magnetic field at r_2 , $r_2 > R$, calculate the distance r_2 .
 Q0
- A1 7.9 cm.
 A2 3.8 cm.
 A3 5.2 cm.
 A4 4.4 cm.
 A5 2.0 cm.
 Q0

- 27 Q0 A hollow cylindrical conductor of inner radius 3.0 mm and
 30 Q0 outer radius 5.0 mm carries a current of 80 A parallel to
 Q0 its axis. The current is uniformly distributed over the
 Q0 cross section of the conductor. Find the magnitude of the
 Q0 magnetic field at a point that is 2.0 mm from the axis of
 Q0 the conductor.
 Q0
 A1 zero.
 A2 8.0 mT.
 A3 5.3 mT.
 A4 10 mT.
 A5 0.7 mT
 Q0
- 28 Q0 A 400-turn coil of total resistance 6.0 ohm has a cross
 31 Q0 sectional area of 30 cm². How rapidly should a magnetic
 Q0 field parallel to the coil axis change in order to induce
 Q0 a current of 0.3 A in the coil?
 Q0
 A1 1.5 T/s.
 A2 0.25 T/s.
 A3 0.67 T/s.
 A4 2.8 T/s.
 A5 0.04 T/s.
 Q0
- 29 Q0 A circular wire loop of area 0.5 m² is perpendicular
 31 Q0 to a magnetic field of 0.8 T. If the coil is removed
 Q0 completely from the field in 0.1 s, the average emf
 Q0 induced in the loop has a magnitude
 Q0
 A1 4.0 V.
 A2 8.0 V.
 A3 2.0 V.
 A4 5.0 V.
 A5 1.0 V.
 Q0
- 30 Q0 A long straight wire carrying a constant current I is in the
 31 Q0 plane of a circular conducting loop as shown in figure (9).
 Q0 If the wire is moved away from the loop toward point A, the
 Q0 current induced in the loop is
 Q0
 A1 clockwise.
 A2 counterclockwise.
 A3 zero.
 A4 into the page.
 A5 out of the page.

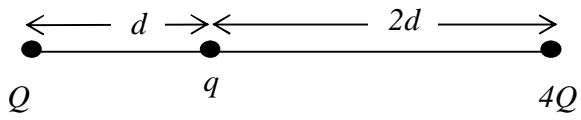


Figure 1

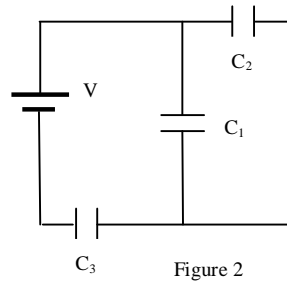


Figure 2

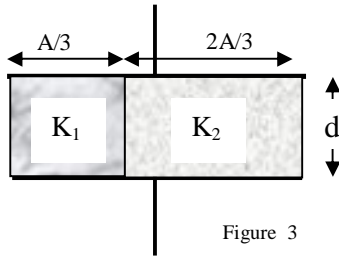


Figure 3

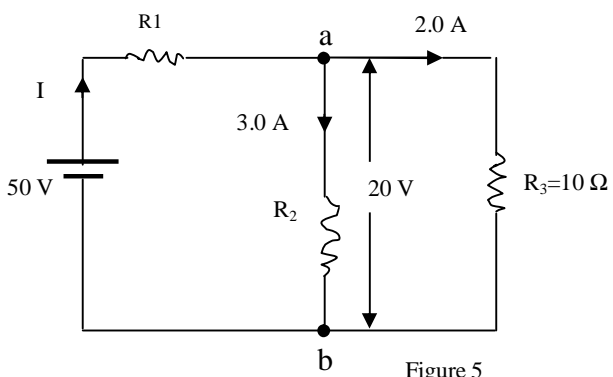


Figure 5

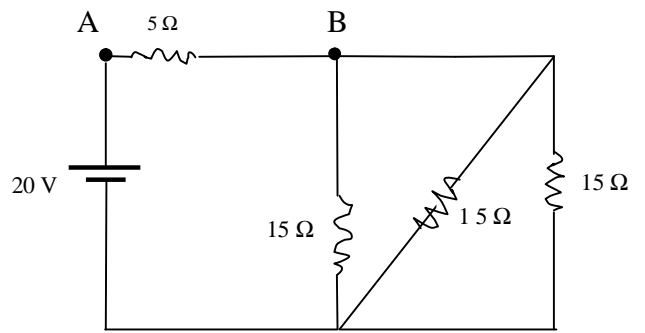


Figure 4

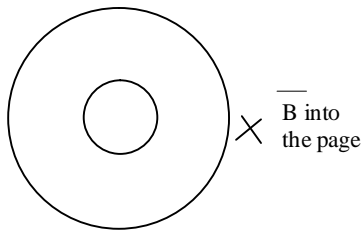


Figure 6

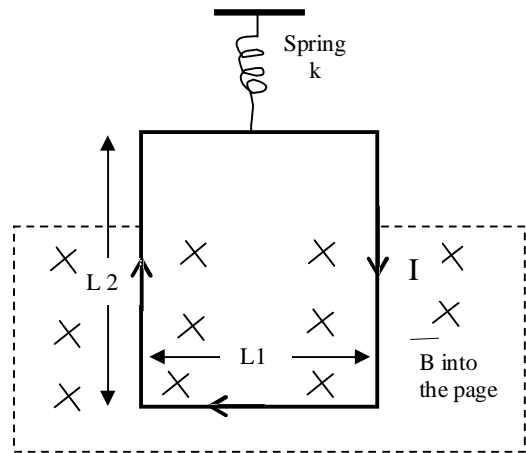


Figure 7

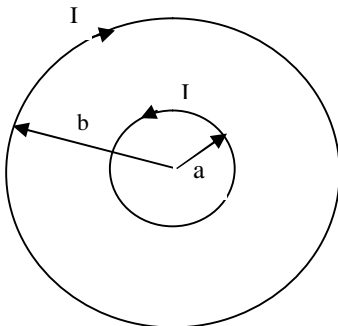


Figure 8

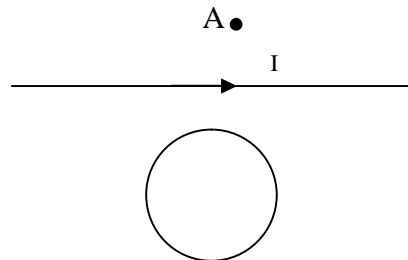


Figure 9