UNIVERSITY OF GAZIANTEP
DEPARTMENT OF ENGINEERING PHYSICS
EP 106 General Physics II
Example Final Exam Questions
01/06/2007 **Time 90 min.**

Marks Obtained	
# of True	
# of False	
Total Mark	
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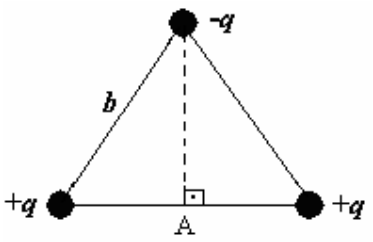
Name	Surname	Dep.	Signature

- Fill in only one answer for each question on the exam paper
- Useful constants: g = 9.8 m/s^2, e = 1.6x10^{-19} C, m_e=9.1x10^{-31} kg, k = 9x10^9 N.m^2/C^2, ε_o = 8.85x10^{-12} C^2/N.m^2, μ_o = 4πx 10^{-7} T.m/A, 1 μF = 10^{-6} F 1 pF = 10^{-9} F



Setup for the qestions 1 - 3

Three point charges are fixed on the corners of an equilateral triangle whose one side is *b* as shown in Figure.

1. What is the magnitude of the Coulomb force acting on charge –*q* due to presence of other charges?

(a) $k\,q^2/b^2$ (b) $\frac{\sqrt{3}}{3}k\,q^2/b^2$ (c) $\sqrt{3}\,k\,q^2/b^2$ (d) $\frac{1}{2}k\,q^2/2b^2$ (e) $2\,k\,q^2/b^2$

2. What is the value of the electric potential at the center (point A) of positive charges?

(a) $(4-2/\sqrt{3})kq/b$ (b) $(4+2/\sqrt{3})kq/b$ (c) kq/b (d) $-2kq/b$ (e) $2\,kq/b$

3. What is the electric potential energy of system?

(a) $\sqrt{3}\,kq^2/b$ (b) $-\sqrt{3}\,kq^2/b$ (c) $3kq^2/b$ (d) $-kq^2/b$ (e) kq^2/b

4. A uniform electric field exist in a region between two oppositely charged plates. An electron is released from rest at the surface of negatively charged plate and strikes the surface of oppositely charged plate, 2 cm away, in time 1.5x10^{-8} s. **What is the magnitude of the electric field between the plates?**

(a) 5x10^3 V/m
(b) 4x10^3 V/m
(c) 3x10^3 V/m
(d) 2x10^3 V/m
(e) 1x10^3 V/m

5. Which of the following is the SI unit of Electric Field, E?

(a) kg·m^2/s·C (b) kg·m^2/s^2·C (c) kg·m^2/s·C (d) kg·m/s^2·C (e) kg·m^3/s^2·C

SAMPLE

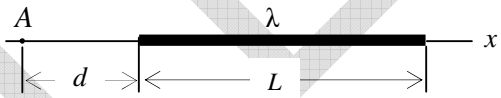
6. A charge Q is distributed uniformly on the surface of a spherical conducting shell of radius 10 cm. The magnitude of electic field on the surface is 10^6 V/m. **What is the magnitude of electric field 20 cm from the center of the shell?**

(a) 500×10^3 V/m (b) 450×10^3 V/m (c) 250×10^3 V/m (d) 45×10^3 V/m (e) 25×10^3 V/m

7. What is the surface charge density in C/m^2 of the the spherical shell in problem 6?

(a) 1.1×10^{-6} (b) 2.2×10^{-6} (c) 4.4×10^{-6} (d) 8.8×10^{-6} (e) 16.2×10^{-6}

8. A wire of uniform charge density λ and length L lies along the x axis as shown in Figure. **What is the electric potential at point *A*?**



(a) $k \lambda \ln[1+d/L]$ (b) $k \lambda \ln[1+L/d]$ (c) $k \lambda L/d$ (d) $k \lambda d/L$ (e) $k \lambda d/(L+d)$

9. The stored energy of a capacitor is 3.0 μJ after having been charged by a 1.5 V battery. **What is the energy of the capacitor after it is charged by 3.0 V battery?**

(a) 1.5 μJ
(b) 3.0 μJ
(c) 4.5 μJ
(d) 6.0 μJ
(e) 12.0 μJ

10. A spherical capacitor is formed from two concentric spherical conducting shells separated by air. Inner sphere has radius a=5 cm and outer has radius b=10 cm.
What is the capacitance in pF of the capacitor?

(a) 7
(b) 11
(c) 14
(d) 21
(e) 30

SAMPLE

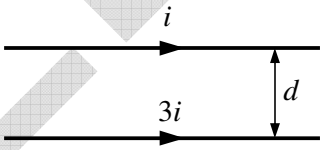
11. A proton enters to a magnetic field $\mathbf{B} = 0.03\mathbf{i} - 0.15\mathbf{j}$ (T) with a velocity $\mathbf{v} = 2.0\text{x}10^6\ \mathbf{i} + 3.0\text{x}10^6\ \mathbf{j}$ (m/s).
What is the magnitude of the magnetic force acting the proton?

(a) $3.36\ \text{x}10^{-14}$ N
(b) $3.90\text{x}10^{-14}$ N
(c) $4.80\text{x}10^{-14}$ N
(d) $5.62\text{x}10^{-14}$ N
(e) $6.24\text{x}10^{-14}$ N

12. A conducting wire, whose resistance *R*, has a semi-circular shape of radius *r* as shown in Figure. If the potential difference between the ends *a* and *b* is *V*,
What is the magnitude of the magnetic field, at the center of the wire?

(a) $\frac{\mu_0 V}{4Rr}$ (b) $\frac{\mu_0 V}{2Rr}$ (c) $\frac{\mu_0 V}{Rr}$ (d) $\frac{2\mu_0 V}{Rr}$ (e) $\frac{4\mu_0 V}{Rr}$

13. The distance between two parallel long wires carrying current *i* and 3*i* is *d* as shown in Figure.



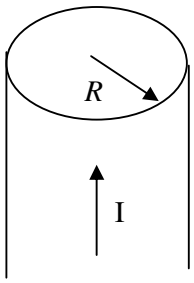
What is the distance from wire of current *i* at which the magnetic field is zero?

(a) *d*/3
(b) *d*/4
(c) *d*/5
(d) *d*/6
(e) *d*/7

14. In problem 13, **what is the magnitude and type of the force per unit length acting on the wires?**

(a) $\mu_0 i^2 / \pi d$; repulsive
(b) $2\mu_0 i^2 / \pi d$; repulsive
(c) $2\mu_0 i^2 / \pi d$; attractive
(d) $3\mu_0 i^2 / 2\pi d$; attractive
(e) $3\mu_0 i^2 / 2\pi d$; repulsive

15. Figure shows a long conducting (cylindrical) wire whose radius is *R*. The wire carries a current I. **What is the magnitude of the magnetic field at a distance *r* = *R*/3?** where *r* is the distance from cylindrical axis.



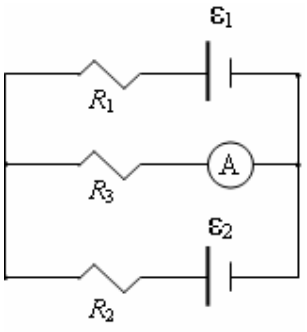
(a) $3\mu_0 I / 2\pi R$
(b) $9\mu_0 I / 2\pi R$
(c) $\mu_0 I / 2\pi R$
(d) $\mu_0 I / 9\pi R$
(e) $\mu_0 I / 6\pi R$

16. Which of the followings are true:
I. Electric field is defined as the force acting on the unit test charge
II. Magnetic force acting on a point charge depends only on magnetic field and its charge
III. Dielectric filling increases the capacitance of a capacitor

(a) only I (b) I and II (c) I and III (d) II and III (e) I, II and III

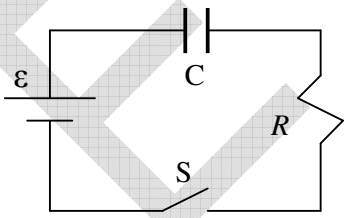
SAMPLE

17. In the circuit given right, the ammeter, reads current 2 A.
If $R_1 = 1\ \Omega$, $R_2 = 2\ \Omega$, $R_3 = 3\ \Omega$, $\varepsilon_1 = 5$ V, **what is the emf of battery ε_2 ?**



(a) 12 V
(b) 14 V
(c) 15 V
(d) 18 V
(e) 22 V

18. A capacitor and a resistor is connected as a series circuit as shown in Figure. After the switch S thrown, the capacitor is charged by the battery.



Assume that, $\varepsilon = 10$ V, $R = 2$ kΩ, $C = 5\mu$F.

What is the current passing through the resistor at $t = 30$ ms?

(a) 0.5 x 10^{-4} A
(b) 1.0 x 10^{-4} A
(c) 2.5 x 10^{-4} A
(d) 5.0 x 10^{-4} A
(e) 10.0 x 10^{-4} A

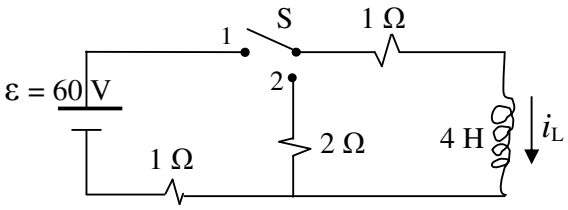
19. The magnetic flux linking each loop of 250-turn coil is given by $\phi(t) = a + bt^2$, where a=3 mWb and b=15 mWb/s^2 are constants. **What is the induced emf in the coil at t = 5 minutes?**

(a) 22.5 V
(b) 22.5 Wb
(c) 2250 V
(d) 2250 Wb
(e) 250 V

20. An air-core solenoid contains 300 turns. It has the length of 25 cm and its cross-sectional area is 4 cm^2. **What is the self induced emf in the solenoid if the current through it is decreasing at the rate of 50 A/s?**

(a) 9 mV (b) 18 mV (c) –9 mV (d) –18 mV (e) –81 mV

21. An ideal battery, three resistors and an ideal inductor are connected as shown in Figure.
Which of the followings is the mathematical expression for the current i_L when the switch (S) is in position 1?



(a) $i_L = 60(1 - e^{-t/4})$
(b) $i_L = 30(1 - e^{-t/2})$
(c) $i_L = 10(1 - e^{-t/2})$
(d) $i_L = 30e^{-t/4}$
(e) $i_L = 10e^{-t/2}$

END OF EXAM

SAMPLE

Answers:

1- C	**6- C**	**11- E**	**16- C**
2- A	**7- D**	**12- A**	**17- A**
3- D	**8- B**	**13- B**	**18- C**
4- E	**9- E**	**14- D**	**19- C**
5- D	**10 -B**	**15- E**	**20- A**
			21- B

SAMPLE