**ECE 256 Midterm Exam** 20 April 2010

**Spring Semester** Time: 18:00

**Name:**

**Number:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | total |
|  |  |  |  |  |  |
| 20 | 20 | 20 | 20 | 20 | 100 |

Open book and open notes.

**Good luck ☺**

1. Answers without necessary steps will not get any credit.
2. Please turn off your mobile phones and put them away.
3. **Yüksek Öğretim Kurumları Disiplin Yönetmeliğinin Madde 9-m gereği sınavlarda kopya yapmak, yaptırmak veya bunlara teşebbüs etmek, Yükseköğretim Kurumundan 1 veya 2 yarıyıl için uzaklaştırma cezasını gerektiren disiplin suçları kapsamına girdiğini biliyorum ve**

Sınav kâğıdımda yazılı olan her şeyin bana ait olduğunu beyan ederim.

**İmza:**

1) As shown in Figure, Q1 and Q2 point charges are placed at (-1,0) and (1,0) points on the X-axis.

Find the total force on the Q3 point charge placed on the Y-axis. Find the value of y coordinate of the Q3 charge where the total force on it is the maximum.

Y

Q3

(y,0)

(1,0)

(-1,0)

X

Q1

Q22

2) Consider a semicircular ring of charge of radius *a* containing a total charge of amount Q as shown in Figure. Assume that the charge is uniformly distributed along the ring. Calculate the total electric field at the center of the ring. This ring is in the X-Y plane.

Y

a

X

3) Determine the work done in carrying a Q=2C point charge from A(0,-3,0) to point B(1,0,0) in a nonuniform electric field along

a) the shortest path (straight line from A to B),

b) on L-shaped path via the origin (AOB) and

c) along the parabola as shown in Figure.

Y

O

B

X

A

4) Consider the charge configuration shown in Figure, consisting of two coaxial, concentric, and infinitely long cylindrical shells of surface charges with radii *a* and *b*, such that *b > a*. The total charge per unit length () on each cylinder is equal in magnitude and opposite in sign. Find the electric field and electrostatic potential everywhere (r < a, a < r < b, r > b).

b

b

a

b

- +

5) Consider a spherical charge distribution with a charge density where Qe is the charge of an electron, and *a* is a the radius of the spherical charge

distribution. a) find the total charge Q in the sphere b) find electric field everywhere c) find electric potential everywhere d) How the results will be modified if you place a proton’s charge to the center of the sphere?

a