The University of Jordan
Electrical Eng. Dept.
Second Exam

Electromagnetism I EE251 يزن ذوقان الحيان
Student Name in Arabic
Answers should be written in ink. **Exam Duration:70 min**

Tues. 12/8/2014
Registration #: 0110494
Mark out of 30:

Question 1

a) Two point charges of **2 nC**, **4 nC** , positioned at **(-1,0,0)**, **(0,-2,0)**, respectively. Calculate the **potential** at **(0,0,1)**. Also, calculate the **energy** of that system of charges, Given $\varepsilon_0 = 10^{-9} / 36\pi$ F/m.

b) Write down the **general expression** used in calculating the **capacitance**, and use it to **derive** the capacitance of a **coaxial cable** of length **L** m, with inner and outer conductors have radii **a**, and **b** respectively (**b>a**). Hence, or otherwise , determine the **resistance** of the dielectric material between the conductors.

Question 2

Given a circular current loop of radius **12** cm situated in the **xy** plane at **z = 0** cm, and passing a current of **8** A. Use **Biot-Savart** law to **derive** the **magnetic field intensity H** ; expressed in cylindrical coordinates. Hence, calculate **H** at (0,0,5) cm. Given $\mu_0 = 4\pi x 10^{-7}$ A/m.

Question 3

a)Consider an infinitely long transmission line consisting of two concentric cylinders having their axes along the z-axis. The inner conductor has radius **a** and carries current **I** while the outer conductor has inner radius **b** and thickness **w** and carries return current **–I** . Assuming that current is uniformly distributed in both conductors, determine **H** , for $b \le \rho \le b + w$ and $\rho \ge b + w$.

b) Write down the **point form** of Maxwell's equations.

Question 4

A particle of mass 2 kg having a 4 C charge starts at the origin with velocity $\mathbf{8a_z}$ m/s and travels in a region where $\mathbf{B = 5\,a_y}$ Wb/m^2 . At **t = 4 s**, calculate

(a) The **velocity** and **acceleration** of the particle

(b) The **magnetic force** on it

$F = QE$

$\frac{dv_x}{dt} = a_x$