COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & Computer Control Engineering

Lecturer : Dr. M. Abdel-Rahim

Course : Electric & Magnetic Fields (1)

Course Code : EE 331 Marks : 40

Date : 26 / 5 / 2015 Time : 2 hour

Final Exam

Answer the following questions :-

1-(a) A 50-nC point charge is located at $A(-3, 1, 4)$ in free space.

(i) Find the locus of all points $P(x, y, z)$ at which $E_x = 100$ V/m.

(ii) Find y_1 if $P(-1, y_1, 4)$ lies on that locus.

(b) A uniform volume charge density of 0.2 $\mu C/m^2$ is present throughout the spherical shell extending from r = 3 cm to r = 5 cm. If $\rho_v = 0$ elsewhere.

(i) Find the total charge present within the shell.

(ii) Find r_1 if half the total charge is located in the region $3 \text{ cm} < r < r_1$.

(10marks) *(A5)*

2- (a) A point charge of 6 μC is located at the origin, a uniform line charge density of 180 nC/m lies along the x- axis, and a uniform sheet of charge equal to 25 nC/m^2 lies in the z = 0 plane.

(i) Find **D** at $A(0, 0, 4)$. (ii) Find **D** at $B(1, 2, 4)$.

(iii) Calculate the total electric flux leaving the surface of a sphere of 4-m radius centered at the origin.

(b) A cubical region of space is defined by the surfaces x = 1.8, y = 1.8, z = 1.8, x = 2, y = 2, and z = 2. If $\mathbf{D} = 3y^2\mathbf{a}_x + 3x^2y\mathbf{a}_y \text{ C/m}^2$.

(i) Find the exact value of the total charge enclosed within the cube by surface integration.

(ii) Find an approximate value for the enclosed charge by evaluating the volume integration at the cube center.

(10marks) *(A5)*

3- (a) Given a surface charge density of 5 nC/m^2 on the plane x = 4, a line charge density of 50 nC/m on the line x = 2, y = 3, and a 4-μC point charge at $P(-3, -2, 4)$, find V_{AB} for points $A(4, 3, 0)$ and $B(5, 0, 2)$.

Members of course Examination Committee:	Signature:	Date:
Lecturer: : Dr. M. Abdel-Rahim	M. Abdel-Rahim	17/5/2015
Course Coordinator : Prof. Samah El Safty	Safty	17/5/2015
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