Electronics and Telecommunication Department

Course Code: ETU601 Date: 28/01/2016 Time: 10.30-11.30 a.m.
Course: Electromagnetic Fields Duration: 1Hr Max Marks: 15

CT-I

Attempt the following

1. Given the vectors $M = -10a_x + 4a_y - 8a_z$ and $N = 8a_x + 7a_y - 2a_z$. Find a unit vector in the direction of $-M + 2N$; the magnitude of $5a_x + N - 3M$; $|M||2N|(M + N)$ (03)
2. Consider the vector field $G = ya_x + 2.5xa_y + 3a_z$ and the point $Q(4,5,2)$. Find the scalar component of G at Q in the direction of $a_N = \frac{1}{3}(2a_x + a_y - 2a_z)$; the vector component of G at Q in the direction of a_N and the angle between $G(r_Q)$ and a_N (03)
3. Express $D = (x^2 + y^2)^{-1}(xa_x + ya_y)$ in cylindrical coordinate system. (03)
4. Point charges of 50nC each are located at $A(1,0,0)$, $B(-1,0,0)$, $C(0,1,0)$ and $D(0,-1,0)$ in free space. Find the total force on the charge at A. (03)
5. A 2μC point charge is located at $A(4,3,5)$ in free space. Find E_ρ, E_ϕ and E_z at $P(8,12,2)$ (03)

ELECTRONICS AND TELECOMMUNICATION DEPARTMENT

Course Code: ETU601 Date: 23/01/2017 Time: 10.30-11.30 a.m.

Course: Electromagnetic Fields Duration: 1Hr Max. marks: 15

CT – I

Attempt the following (any FIVE)

1.	The vector from the origin to point A is given as $(6,-2,-4)$, and the unit vector directed from the origin towards point B is $(2,-2,1)/3$. If points A and B are ten units apart, find the coordinates of point B.	03
2.	Show that the vector fields $A = \rho cos\emptyset a_\rho + \rho sin\emptyset a_\emptyset + \rho a_z$ and $B = \rho cos\emptyset a_\rho + \rho sin\emptyset a_\emptyset - \rho a_z$ are everywhere perpendicular to each other.	03
3.	A 2 μC point charge is located at $A(4,3,5)$ in free space. Find E_ρ, $E_\emptyset$ and E_z at $P(8,12,2)$.	03
4.	A uniform volume charge density of 0.2 μC/m3 is present throughout the spherical shell extending from $r = 3\ cm$ to $r = 5\ cm$. If $\rho_v = 0$ elsewhere. Find the total charge present throughout the shell.	03
5.	The cylindrical surface $\rho = 8\ cm$ contains the surface charge density, $\rho_s = 5e^{-20\|z\|}\ nC/m^2$. What is the total amount of charge present?	03
6.	Given the electric flux density, $D = 0.3r^2 a_r\ nC/m^2$ in free space. Find E at $P(r = 2, \theta = 25^0, \emptyset = 90^0$	03

GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI

(An Autonomous Institute of Govt. of Maharashtra)

Electronics and Telecommunication department

Class test I — Marks: 15

Sub: ETU 601 Electromagnetic fields — Date: 2 Feb, 2015 Solve any three

Q1. Transform the vector field $\mathbf{F}=2r\cos\varphi\mathbf{a}_r+\mathbf{a}_\varphi$ into Cartesian co-ordinates & evaluate it at P (4,-2, 3). Also find $\mathbf{a}_F$ at P. (5M)

Q2. Calculate **D** in rectangular co-ordinates at P (2,-3, 6) m produced by (5M)

a) A point charge Q_a=5.4mC at Q(-200,300,-600)cm

b) A uniform line charge ρ_l =22mC/m on the y-axis.

c) A uniform surface charge density $\rho_s=126\mu C/m^2$ on the plane z=-8m

Q3. a) Write short note on i) Scalar field ii) Vector field (2 +3M)

b) Derive the expression for **E** due to infinite uniform line charge along z-axis

Q4. a) Find the **E** at (0,φ,h) in cylindrical co-ordinates due to the uniformly charged disc $r \leq a$, z=0 (disc of radius a in xy plane).

b) Give the statement of Gauss's law and obtain relation between **D** and **E**. (3+2M)

Government College of Engineering, Amravati
(An Autonomous Institute of Government of Maharashtra)

Sixth Semester B. Tech.
(Electronics and Telecommunication)

CT1 (2019-2020)

Course Code: ETU601

Course Name: Electromagnetic Fields

Time: 1 Hr **Max. Marks: 15**

Instructions to Candidate

1) Attempt any FIVE of the following.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.
6) All the symbols have their usual meaning.

1.	a)	Given the vectors $M = -10a_x + 4a_y - 8a_z$ and $N = 8a_x + 7a_y - 2a_z$, find: a) a unit vector in the direction of $-M + 2N$; b) the magnitude of $5a_x + N - 3M$; c) $\|M\|\|2N\|(M + N)$	3	CO1
	b)	At point $P(-3,-4,5)$, express that vector that extends from P to $Q(2,0,-1)$ in : a) Rectangular coordinates b) Cylindrical coordinates c) Spherical coordinates	3	CO1

Contd...

2.	a)	Let $Q_1 = 8\mu C$ be located at $P_1(2,5,8)$ while $Q_2 = -5\mu C$ is at $P_2(6,15,8)$. Let $\varepsilon = \varepsilon_0$. a) Find F_2, the force on Q_2 b) Find the coordinates of P_3 if a charge Q_3 experiences a total force $F_3 = 0$ at P_3.	3	CO2 CO3
	b)	A uniform volume charge density of $0.2\mu C/m^3$ is present throughout the spherical shell extending from $r = 3cm$ to $r = 5cm$. If $\rho_V = 0$ elsewhere, find the total charge present throughout the shell.	3	CO2 CO3
3.	a)	A point charge of $12nC$ is located at the origin. Four uniform line charges are located in the $x = 0$ plane as follows: $80nC/m$ at $y = -1$ and $-5m, -50nC/m$ at $y = -2$ and $-4m$. a) Find D at $P(0,-3,2)$ b) How much electric flux crosses the plane $y = -3$, and in what direction? c) How much electric flux leaves the surface of a sphere, 4m in radius, centered at $C(0,-3,0)$?	3	CO2 CO3
	b)	Volume charge density is located in free space as $\rho_V = 2e^{-1000r} nC/m^3$ for $0 < r < 1\ mm$, and $\rho_V = 0$ elsewhere. a) Find the total charge enclosed by the spherical surface $r = 1mm$. b) By using Gauss's law, calculate the value of D_r on the surface $r = 1mm$.	3	CO2 CO3