

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY
SECOND YEAR FALL SEMESTER ELECTRICAL ENGINEERING
EXAMINATION 2016

BATCH 2014-15 & PREVIOUS BATCHES

Time: 3 Hours

Date: 01-12-2016
Max. Marks: 60

ELECTROMAGNETIC FIELDS-EE-382

NOTE: 1. Attempt all questions.
2. All questions carry equal marks.

Q.No.1 (a): Define the term electric dipole and dipole moment. Derive an expression for the electric potential and electric field intensity due to dipole. [6]

(b) Point charges of $1\mu\text{C}$ and $-1\mu\text{C}$ are located at $(0, 0, 0.5)$ and $(0, 0, -0.5)$ respectively. Treating these two charges as dipole at the origin. Calculate:

- (i) V at $P(3, 0, 4)$ $V = \frac{1}{4\pi\epsilon_0} \frac{q}{r}$
- (ii) E at P $E = \frac{1}{4\pi\epsilon_0} \frac{q}{r^2}$
- (iii) Now find the exact values of (ii) V at P and (iv) E at P . [6]

Q.No.2 (a): Using the step by step approach derive an expression for energy density in an electrostatic fields? [6]

(b) Find the energy stored in free space for the region $2\text{mm} < r < 3\text{mm}$, $0 < \theta < 90^\circ$, $0 < \phi < 90^\circ$, given the potential field: $V = 300\cos\theta/r^2$ V. [6] $W = \frac{1}{2} \int \rho V dV$

Q.No.3 (a): Derive an expression for electric field intensity due to an infinite sheet of charge? [6]

(b): Find E at $P(1, 5, 2)$ in free space if a point charge of $6\mu\text{C}$ is located at $Q(0, 0, 1)$, a uniform line charge of 180 nC/m lies along the x -axis, and a uniform sheet of charge equal to 25 nC/m^2 lies in the plane $Z = -1$. [6]

Q.No.4 (a): Apply the Gauss's law to a differential volume element in rectangular coordinate system and derive the Maxwell's first equation? [6]

(b): Let $D = 6xyz^2 \mathbf{a}_x + 3x^2z^2 \mathbf{a}_y + 6x^2yz \mathbf{a}_z$ C/m^2 . Find the total charge lying within the region bounded by $x=1$ and 3 , $y=0$ and 1 , and $z = -1$ and 1 by separately evaluating each side of the divergence theorem. [6] $\oint \mathbf{D} \cdot d\mathbf{A} = Q_{\text{enc}}$

Q.No.5 (a): Using Laplace equation derive an expression for the capacitance between the conductors of coaxial cable? [6]

(b): Apply the Ampere Circuital Law to the perimeter of a differential surface element in Cartesian Coordinate System and hence derive an expression for the point form of the A.C.L. [6]

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY
S.E.(EE) Fall Semester Mid-Term Examination 2016

Mid Term.

Max.Marks:20

Electromagnetic Fields - (EE-382)

NOTE: 1. Attempt all questions.
2. All questions carry equal marks.

Q.No.1 (a): The surfaces $r=2$ and 4 , $\theta=30^\circ$ and 50° and $\Phi=20^\circ$ and 60° identify a closed surface.

- (i) Find the volume enclosed.
- (ii) Find the total area of the enclosed surface.
- (iii) Find the length of the longest straight line that lies within the surface? [5]

(b): Let a point charge $Q_1=25\text{nc}$ is located at $P_1(4,-2,7)$ and a charge $Q_2=60\text{nc}$ is located at $P_2(-3,4,-2)$. Find E at $P_3(1,2,3)$? [5]

Q.No.2 (a): A $2\mu\text{c}$ point charge is located at $A(4,3,5)$ in free space. Find E_r , E_θ and E_ϕ at $P(8,12,2)$? [5]

(b): Define the Gauss's law, what are the conditions to be considered before applying Gauss's law to different charge distributions? [5]
