

EE/EX-401(N)

B. E. (Fourth Semester) EXAMINATION, June, 2010

(New Scheme)

(Common for EE & EX Engg. Branch)

ELECTROMAGNETIC THEORY

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt one question from each Unit. All questions carry equal marks.

Unit-I

- (a) Discuss and prove Divergence theorem.
(b) Determine the capacitance per unit length between two infinitely long concentric conducting cylinders. The outside radius of the inner conductor is a and the inner radius of the outer conductor is b .

Or

- (a) Discuss some application of Gauss's law for some symmetrical charge distributions.
(b) In spherical co-ordinates, a volume charge density $\rho_v = 10e^{-2r} \text{ C/m}^2$ is present :
 - Determine divergence D .
 - Check your results by evaluating $\nabla \cdot D$.

Unit-II

- (a) Obtain the expression of the equation of continuity for steady currents.
(b) There exists a potential of $V = -2.5 \text{ V}$ on a conductor at 0.02 m and $V = 15.0 \text{ V}$ at $r = 0.35 \text{ m}$. A dielectric material whose $\epsilon_r = 3.0$ exists between the conductors. Determine the surface charge densities of the conductors.

Or

- (a) If a dielectric material of $\epsilon_r = 4.0$ is kept in an electric field $E = 3a_x + 2a_y + a_z$, V/m, find the polarization.
(b) Obtain the expression of energy stored in an electrostatic field.

Unit-III

- (a) A thin conductor of finite length is along z -axis lying between $z = z_1$ and $z = z_2$. Find H at a point P in the x - y plane. What is H if $z_1 = \infty$ and $z_2 = -\infty$?
(b) Prove the differential form of Ampere's circuit law.

Or

- (a) Determine the magnetic flux between the conductors of a co-axial cable of length 10 m . The radius of the inner conductors is $a = 1 \text{ cm}$ and this of the outer conductor is 2 cm . The current enclosed is 2 A .
(b) Determine the force between two long and parallel current carrying conductors.

Unit-IV

7. (a) When the vector magnetic potential is given by :-

$$A = \frac{1}{r^3} (2 \cdot 0 \cos \theta a_r + \sin \theta a_\theta)$$

find the magnetic flux density.

- (b) Determine the energy stored in the inductor.

Or

8. (a) Determine the self-inductance of solenoid.
(b) Obtain the Maxwell's equation for harmonically varying field.

Unit-V

9. Obtain the relation between E and H in uniform plane wave.

Or

10. (a) What do you understand by circular polarization ?
(b) Discuss and prove Poynting vector theorem.