Uni. Roll No.........................

Course: B.Tech, I-Year, II - Mid Term, Examination, 2014-15

Subject: Engineering Physics (AHP-103)

Time: 90 Minutes   M. M: 20

Notes:-

1. Answer **All** questions from **Section A. Any Three** from **Section B** and **Any Three** from **Section C**.
2. All questions of a particular section should be answer collectively at one place.
3. Answer should be to-the-point and whatever required supplemented with neat sketches.

Section-A

Attempt all questions. $1 \times 5 = 5$

I. State Biot Savart law.
II. Write Laplace and Poisson's equations.
III. State Ampere's circuital law.
IV. Write the integral form of Maxwell's equation based on Faraday's Law.
V. Mention the relation among $\vec{D}$, $\vec{E}$ and $\vec{P}$.

Section-B

Attempt any three questions. $2 \times 3 = 6$

I. Derive expressions for the electric field due a non conducting sphere at a point (i) outside the sphere (ii) inside the sphere.

II. What is skin depth? The relative permeability and conductivity of aluminium are $\mu_r = 1$ and $\sigma = 3.8 \times 10^7$ mho/m respectively. If the skin depth for aluminium is 47.16×10^{-6} m, find the frequency of the wave entering in it.

III. The conduction current flowing through a wire with conductivity, $\sigma = 4 \times 10^7$ S/m and relative permittivity, $\epsilon_r = 1$ is by $I_c = 4 \times 10^3$ Sin10^8t Amp. Find the displacement current. Explain how is it different from conduction current?

IV. Dielectric constant of helium at N.T.P is 1.000074. Find the dipole moment induced in each helium atom when the gas is in an electric field of intensity 10^3 Volt/meter. Also calculate the polarisability of helium atom.

Section-C

Attempt any three questions. $3 \times 3 = 9$

I. Show that velocity of plane electromagnetic waves in free space is given by $c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$. If relative permittivity and relative permeability of distilled water are 81 and 1 respectively, find the velocity of light in it.

II. Deduce Poynting theorem for the flow of energy in electromagnetic field. Also discuss its physical significance.

III. Obtain an expression of Lorentz equation for local field and hence deduce Clausius - Mossotti relation.

IV. Describe the Langevin's theory of diamagnetism and derive an expression for the intensity of magnetization of diamagnetic substances.

Physical Constants

Speed of light (c) = 3×10^8 m/sec

Permittivity of free space (ϵ_0) = 8.85×10^{-12} coul^2/Newton·m^2

Permeability of free space (μ_0) = $4\pi \times 10^{-7}$ Newton/Amp^2