31 March

B.Tech, I-Year, II - Mid Term (Even Sem.) Examination, 2014-15

Subject: Engineering Physics (AHP-103)

Time: 90 Minutes **M. M: 20**

Section-A

Attempt all five questions. **1× 5 = 5**

(I) **Write the mathematical form of Ampere's circuital law.**

(II) **Express the Poynting vector in terms of electric and magnetic fields vectors.**

(III) **If the magnitude of magnetic field in a plane wave is 1 amp/meter, find the magnitude of electric field in free space.**

(IV) **The skin-depth of electromagnetic wave in a conducting medium is 50×10^{-6} m, calculate the attenuation constant.**

(V) **Distinguish between the paramagnetism and diamagnetism.**

Section-B

Attempt any three questions. **2x3 = 6**

(I) **The conduction current flowing through a wire with conductivity $\sigma = 6X10^{8}$ S/m and relative permittivity $\varepsilon_r = 1$ is given by $I_c = 10 \sin \omega t$ ampere. If $\omega = 10^{10}$ radian, find the displacement current.**

(II) **The sunlight strikes the upper atmosphere of earth with energy flux 1.00 kWm^{-2}. What will be the peak values of electric and magnetic fields at the points?**

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(III) The dielectric constant of the medium is 4. Electric field in the dielectric is 10^{6} V/m. Calculate electric displacement and polarization.

(IV) A 0.5cm thick insulator of dielectric constant 10 is filled inside the plates, separated by 1 cm and of area of plates 100 cm^2 of a parallel plate capacitor, the potential difference between the plates is 100V. Find the value of E and P.

Section-C

Attempt any three questions. 3x3=9

(I) State and prove the poynting theorem.

(II) Using the Maxwell equations, show that the EM waves travel in free space with the speed of light.

(III) Derive the differential equations of electric and magnetic fields applicable in conducting media. Also explain the physical significance of penetration depth (skin depth).

(IV) Derive the expression for internal local field in the dielectric and hence obtain the Clausius Mossoti relation for electronic polarisability.

Physical data

$\mu_0 = 4\pi x10^{-7}\ N/A^2$, $\varepsilon_0 = 8.85x10^{-12}\ C^2/N\text{-}m^2$