

End Semester Examinations - 2015-16 Even Semester - May 2016

15PH3010 Electromagnetic Theory

Set A

Time : 3 hrs
Total Marks: 100

1. a. Use Ampere's circuital law, Faraday's law and Gauss's law, Derive the Maxwell's equations to obtain its integral and differential form. (10 Marks)
b. State Gauss's law. Define electric flux density. (3 Marks)
c. Derive Poisson's and Laplace's equation. (7 Marks)

OR
2. a. Write a short note on displacement current (5 Marks)
b. Write down the boundary conditions at the interface between different media in both scalar and vector forms. (15 Marks)
3. a. Derive the magnetic flux density around infinitely long straight conductor using Biot Savart law (15 Marks)
b. Define divergence and its physical meaning. (5 Marks)

OR
4. a. Explain Biot Savart law with a diagram. Using the application of Biot - Savart's law find out the magnetic field density and magnetic field intensity at any point along the axis of circular coil. (10 Marks)
b. State and prove boundary conditions by the application of Maxwell's equations. (10 Marks)
5. a. Briefly explain characteristic impedance and derive the equations. (15 Marks)
b. An electromagnetic wave of frequency $f = 2.0$ MHz passes from vacuum into a non-magnetic medium with relative permittivity 3. Calculate the increment in its wavelength. Assume that for a non-magnetic medium $\mu_r = 1$ (5 Marks)

OR
6. Explain the significance of Poynting vector and derive expression for electric field and magnetic field energy. (20 Marks)
7. a. What is a Green's theorem. Prove it by deriving the mathematical expression for Green's theorem (10 Marks)
b. Derive the electric field in free space (10 Marks)

OR
8. Explain the wave propagation in a perfect dielectric. (20 marks)
9. a. Derive the expressions for attenuation constant, phase constant and intrinsic impedance for a uniform plane wave in a good conductor. (15 Marks)
b. For a lossy dielectric material having $\mu_r = 1$, $\epsilon_r = 48$, $\sigma = 20$ s/m. Calculate the propagation constant at a frequency of 16 GHz. (5 Marks)

Wishing you All the Best