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**B.E / B.Tech ( Full Time ) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013**

**ELECTRICAL AND ELECTRONICS ENGINEERING**

**III Semester**

**EE231 / EE274 / EE9202 ELECTROMAGNETIC THEORY**

(Regulation 2002/2004/2008)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

**PART-A (10 x 2 = 20 Marks)**

1. Mention any two natural and manmade sources of electromagnetic fields.
2. State Stoke's theorem and mention its applications.
3. Compare the Electric field intensity(E) due to a point charge and infinitely large uniformly charged surface.
4. Define dielectric strength and mention the same for air.
5. State Ampere's law .
6. State Lorentz law of force with vector diagram.
7. Explain Lenz law with a suitable practical example.
8. Write the link equations between circuit and field theory approaches.
9. Compare the electromagnetic wave velocity in free space and lossless dielectric.
10. What is the direction of electromagnetic field propagation if **E** and **H** are polarized in x and z directions respectively?

**Part – B ( 5 x 16 = 80 marks)**

11. Derive **E** due to an infinitely long uniformly charged conductor using Coulomb's law and Gauss's law and compare the methods. (6+6+4)
12. a) Explain and draw the electric field and equipotential lines inside and outside a conductor.

**(OR)**

- b) Field under DC transmission line:  
Two long parallel conductor of a DC transmission line separated by 2 meter have charges of  $\rho_l = 5\mu\text{c} / \text{m}$  of opposite signs. Both the lines are 8 meter above the ground. What is  $|E|$  at 4 m directly below one of the lines.

13. a) Calculation of H using Ampere's law due to Infinite large single sheet, two sheets separated by a distance with current of same direction and opposite direction.(6+5+5)

(OR)

- b) Derive the magnetic boundary conditions at the interface of two different magnetic media.

14. a) Consider a parallel plate capacitor having a plate area of  $1\text{cm}^2$  each, where the plates are separated by a distance of  $0.1\text{mm}$  by a dielectric having the following properties at  $1\text{MHz}$ ,  $\epsilon_r=2$ ,  $\sigma=10^{-7}\text{ S/m}$ . Calculate C, R, displacement and conduction currents and  $\tan\delta$ . Derive the formulae used. (8+8)

(OR)

- b) From the basic laws, derive all the Maxwell's equations both in differential and integral form.

15. a) Derive electromagnetic field waves in free space along with all the characterizing parameters.

(OR)

- b) Explain and derive Skin depth.

Derive the increase in resistance with frequency using a circular conductor for  $50\text{Hz}$ ,  $50\text{kHz}$  and  $50\text{GHz}$  and comment on the result for Cu conductor (whose conductivity is  $5.87 \times 10^7\text{ S/m}$ ) (8+8)