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**Code No.: 21314 S**

# VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

**B.E. II Year (E.C.E.) I-Semester Supplementary Examinations, May/June-2017**

**Electromagnetic Theory**

Time: 3 hours Max. Marks: 70

*Note: Answer ALL questions in Part-A and any FIVE from Part-B*

***Part-A (10 X 2=20 Marks)***

1. State Coulomb's law of force between any two point charges, and indicate the units of the quantities in the force equation.
2. Give the expression for curl in spherical coordinate system
3. Find the electric field intensity for electric potential function: $V = x - y + xy + 2z$.
4. Write about equation of continuity of current. Give its applications.
5. State Biot-Savart's Law.
6. Write the Lorentz's force equation.
7. List characteristics of an uniform plane wave.
8. Determine the skindepth of copper medium at 6 MHz ($\sigma_{cu} = 5.8 \times 10^7$S/m)
9. What is loss tangent? Where do you use it?
10. What is surface impedance? What is the time phase difference between Electricfield intensity and magnetic field intensity in conductive medium

***Part-B (5 × 10 = 50 Marks)***
***(All bits carry equal marks)***

11. a) Derive an expression for Electric field intensity due to an infinite line charge located along $z$ axis using Coulomb's law.
    b) Derive an expression for Electric field intensity due to an infinite sheet of charge located in the $xy$ plane using Gauss' law.

12. a) Starting from Guass' law, derive Poisson's and Laplace's equations.
    b) Derive an expression for the capacitance of two conductor coaxial transmission line.

13. a) A circular loop consists of 25 turns of very fine wire of radius 20 cm, and carries a current of 1.6 A. Find the magnetic field intensity.
    b) Explain the difference between Magnetic scalar potential and Magnetic vector potential.

14. a) Explain how Ampere's circuital law is modified for time varying Electromagnetic fields.
    b) Find the displacement current density, if the magnetic field intensity in air medium is given by $\vec{H} = y^2\ \hat{a}_x + 3x\ \hat{a}_y$ A/m.

15. a) State Poynting's theorem and explain the significance of Poyning's vector.
    b) Derive expressions for reflection and transmission coefficients, when a uniform plane wave incidents normally on to the surface of a perfect dielectric.

*Contd... 2*

16. a) Derive the experssion for intrinsic impedance of the low loss dielectric medium.

    b) In cylindrical coordinates the magnetic field intensity is given by $\vec{B} = \frac{2}{r}\hat{a}_{\phi}$ Wb/m$^2$. Determine the magnetic flux crossing the plane surface defined by $0.5 \leq r \leq 2.5$ m, $0 \leq z \leq 2$ m.

17. Answer any ***two*** of the following:

    a) Derive the wave equation for Magnetic field in general médium.

    b) Find $\alpha, \beta, \eta, \gamma$ for a ferrite at 10 *GHz* when $\varepsilon_r = 9$, $\mu_r = 4$, $\sigma = 5.8 \times 10^7$ S/m.

    c) Distinguish between Self inductance and Mutual inductance.

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