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Code No. : 13405 O3

**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**  
**B.E. (ECE) II Year I-Semester Old Examinations, May/June-2018**

**Electromagnetic Theory**

Time: 3 hours

Max. Marks: 70

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

**Part-A (10 × 2 = 20 Marks)**

1. State Coulomb's law.
2. Describe about Azimuthal symmetry.
3. Write about importance of uniqueness theorem.
4. Compare homogeneous and isotropic mediums.
5. What is the inconsistency in Ampere's circuital law?
6. Describe the sources for steady magnetic fields.
7. List Maxwell's equations in dielectric medium for static fields.
8. Write important characteristics of Uniform Plane Wave.
9. Relate reflection coefficient with transmission coefficient of an electromagnetic wave.
10. Differentiate Elliptical and circular wave polarizations.

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

11. a) Write various charge distributions in electrostatics. Write down integral expressions for finding total charge of these distributions.  
b) The surface of a spherical conducting shell carries a uniform charge density  $\rho \text{ C/m}^3$ . Find the field intensity due to a spherical shell both inside and outside.
12. a) Derive Poisson's equation.  
b) The surface at  $x = 0$  separates two perfect dielectrics.  
For  $x > 0$   $\epsilon_{r1} = 3$  and  $x < 0$   $\epsilon_{r2} = 5$ . If  $\vec{E}_1 = 80\hat{a}_x - 60\hat{a}_y - 30\hat{a}_z \text{ V/m}$ .  
Find  $\vec{D}_1$ ,  $\vec{E}_2$  and  $\vec{D}_2$  if the boundary is charge free.
13. a) Explain about magnetic potentials.  
b) A current sheet  $\vec{K} = 8\hat{a}_x \text{ A/m}$  flows in the region  $-2 < y < 2$  in the plane  $Z = 0$ . Show that  $\vec{H}$  at  $P(0,0,3)$  is  $-8\hat{a}_y$ .
14. a) Formulate wave equation for magnetic field in dielectric medium.  
b) The magnetic field intensity associated with a uniform plane wave propagating in free space is given by  $\vec{H} = H_0 [\cos(9\pi \times 10^8 t + 3\pi y)\hat{a}_x + \sin(9\pi \times 10^8 t + 3\pi y)\hat{a}_y] \text{ A/m}$ . Find the frequency, the direction of propagation and the associated electric field intensity.

- 15. a) Differentiate the average Poynting vector from the instantaneous Poynting vector. Give a proof of the Poynting theorem.
- b) A plane wave travelling in free space has an electric field intensity of 61.39 v/m. Find Poynting vector.
- 16. a) An infinite sheets with charge density of  $10\eta\text{C}/\text{m}^2$  is located at  $y = 4$  m. Find electric field at i) origin ii)  $y = 5$  m.
- b) State and derive Continuity of current equation.
- 17. Answer any *two* of the following:
  - a) Applications of Biot-Savarts law.
  - b) Write short note on Phasor Maxwell's equations.
  - c) Reflection of plane waves by a perfect dielectric.

