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Code No. : 13304 O3

**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**  
**B.E. (EEE) 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 Gauss law for electrostatic fields.
2. In the spherical coordinate system, the coordinates of a point are  $(3, 70^\circ, 50^\circ)$ . Find the coordinates of a point in Cartesian and circular cylindrical coordinate systems.
3. Given that the relaxation time of a certain material is 1500 days. Identify the nature of that material and justify your answer.
4. Define the term Polarization.
5. Define the terms magnetic susceptibility and dipole moment.
6. Name two fundamental laws used in magneto static fields to determine the magnetic field strength of an electromagnet. Is there any interdependency between them? If so mention it.
7. Mention at least four applications of Faraday's laws of electromagnetic induction.
8. In a non magnetic medium  $E = 5 \sin(2\pi \times 10^7 t - 0.9x) a_x$  V/m. Find  $\epsilon_r$  and  $\eta$ .
9. Define the term electromagnetic compatibility.
10. What is the purpose of grounding?

**Part-B (5 × 10 = 50 Marks)**

11. a) Four charges of each  $-12$  C are placed at the four corners of a square of side 13 cm [6]  
Determine E at the center of square.  
b) Derive the relationship between the strength of electric field (E) and its electric potential [4]
12. a) State and explain Uniqueness theorem. [5]  
b) Two extensive homogeneous isotropic dielectrics meet on plane  $Z=0$ . For  $z > 0$ ,  $\epsilon_{r1}=4$  [5]  
and for  $z < 0$ ,  $\epsilon_{r2}=5$ . A uniform electric field  $E_1=5 a_x-3 a_y+6 a_z$  kV/m exists for  $z \geq 0$ . Find for  $z \leq 0$ .
13. a) Obtain an expression for magnetic field intensity due to an infinitely long coaxial cable. [6]  
b) Write the analogy between electric and magnetic circuits. [4]
14. a) Derive the wave equation for uniform plane waves. [5]  
b) In a medium characterized by  $\sigma = 0, \mu = \mu_0, \epsilon_0$  and  $H = 30 \sin(10^8 t - \beta z) a_y$  A/m, [5]  
Calculate  $\beta$  and E.
15. a) Explain different sources and characteristics of EMI. [6]  
b) What is the purpose of shielding? [4]

16. a) A point charge of  $26 \mu\text{C}$  is located at origin, a uniform line charge density of  $65 \text{ nC/m}$  lies along the x-axis and a uniform sheet of charge with  $78 \text{ nC/m}^2$  lies in  $z=0$  plane. Find electric flux density at point  $K(6,-8,-5)$ . [6]

b) Given that, with reference to a conductor-free space interface one of the boundary condition is that inside the conductor, the static electric field intensity is zero. Is it true? Justify your answer. [4]

17. Answer any *two* of the following:

a) Write Four Maxwell Equations for time variant fields and give their significance. [5]

b) State and Prove Poynting's Theorem [5]

c) Discuss the Control techniques of EMI [5]

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