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BIEE-005

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

00744 **June, 2017**

BIEE-005 : ELECTROMAGNETIC THEORY

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any* ***five*** *questions. All questions carry equal marks. Use of scientific calculator is allowed.*

1. (a) Prove that the electric field intensity is equal to the negative gradient of the potential. 7

(b) Find the electric field intensity at a point 'P' located at (0, 0, h) m due to the charge of surface charge density 'σ' C/m^2 uniformly distributed over the circular disc $r \leq a$, $z = 0$ m. 7

2. (a) Derive the expression for the capacitance of an infinite single wire running parallel to the ground. 7

(b) The potential field at any point in a space containing dielectric material of relative permittivity 2·1 is given by $V = 5x^2y + 3yz^2 + 6xz$ volt where x, y, z are in metres. Find the volume charge density at point 'm'. 7

3. (a) Explain the Laplace's and Poisson's equations. State their significance in electrostatic field problems. 7

(b) Derive the boundary relations for E-field and H-field. 7

4. (a) Starting with Ampere's law, derive Maxwell's equation in integral form. Obtain the corresponding relation by applying the Stokes' theorem. 7

(b) Obtain the expression for energy density in an electromagnetic field. Using vector potential concept, find the magnetic intensity about a long straight wire carrying current 'I'. 7

5. (a) Derive the relation between 'E' and 'H' in uniform plane wave propagation. Discuss the types of polarization. 7

(b) The electric fields associated with a plane wave travelling in a perfect dielectric medium is given by

$E_x(z, t) = 10 \cos [2\pi \times 10^7 t - 0{\cdot}1\pi . x]$ V/m.

Find the velocity of propagation and intrinsic impedance. Assume $\mu = \mu_0$. 7

6. (a) Explain the methods for impedance matching and impedance measurement for a transmission line. 7

(b) What is Smith's chart and why is it useful in making transmission line calculations ? 7

7. Write short notes on any ***two*** of the following : *2×7=14*

(a) Graphical Method of Solving Electrostatic Problems

(b) Snell's Law of Wave Refraction

(c) Coulomb's Law and its Applications