

**B.Tech. - VIEP - ELECTRICAL ENGINEERING
(BTELVI)****Term-End Examination****June, 2016**

00066

BIEE-005 : ELECTROMAGNETIC THEORY*Time : 3 hours**Maximum Marks : 70*

Note : Answer any seven questions. All questions carry equal marks. All the questions are to be answered in English only.

1. Show that the potential at a point distant r_1 and r_2 respectively from the centres of a long parallel pair of wires of negligible cross-section are having equal and opposite linear charge density λ coulombs per metre, is given by

$$\phi = \frac{\lambda}{4\pi\epsilon_0} \log_e \left(\frac{r_2}{r_1} \right). \quad 10$$

2. Derive the capacitance of a cylindrical coaxial capacitor using Laplace equation. 10
3. Calculate the induced dipole moment per unit volume of helium gas placed in an electric field of 6×10^5 V/m. The molecular polarisability of helium is 2.33×10^{-41} Farad-m² and the density of helium is 20.6×10^{25} molecules/m³. 10

4. State Biot-Savart law and relate it to Ampere's law. Show that the divergence of magnetic induction is always zero. 5+5=10

5. Show that the equation of continuity $\text{div } \mathbf{J} + \frac{\partial \rho}{\partial t} = 0$ is contained in Maxwell's equations. 10

6. Deduce an expression for the velocity of propagation of a plane electromagnetic wave in a medium of dielectric constant ϵ and permeability μ . 10

7. Calculate the degree of polarisation for ordinary light reflected from glass (refractive index 1.5) at an angle of incidence 45° . 10

8. Show that the energy of interaction between two balls, whose distribution of charges e_1 and e_2 is spherically symmetric, equals to $\frac{1}{4\pi\epsilon_0} \left(\frac{e_1 e_2}{a} \right)$, where the distance between the centres of the balls is a . 10

9. Show that the potential function
$$\phi = q (x^2 + y^2 + z^2)^{-1/2}$$
 satisfies the Laplace's equations. 10

10. Write short notes on any *two* of the following : *5+5=10*

- (a) Impedance Matching
 - (b) Boundary Conditions in Electrostatics
 - (c) Standing Waves
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