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BIEE-009

00051

B.TECH. IN ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

December, 2012

BIEE-009 : APPLIED ELECTROMAGNETICS

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Define divergence of a vector field. Derive the expression of div $\vec{A}$ in cartesian co-ordinates. 7

   (b) Determine the charge density of the field $\vec{D} = \frac{Q}{\pi r^2}(1-\cos 3r)\,\vec{q}_r$ in spherical co-ordinate. 7

2. (a) Derive an expression for the capacitance of a parallel plate capacitor. Also derive an expression for the energy stored in this type of capacitor. 7

(b) A point charge $Q=30\times10^{-9}C$ is located at the origin in cartesian co-ordinates. Find the electric flux density $\vec{D}$ due to this charge at $(1, 3, -4)$ meters. 7

3. (a) State and prove the Biot-Savart's law. 7

(b) Calculate the axial magnetic field due to a current I flowing through a circular loop of radius "r" at a distance "d" from the centre along its axis. 7

4. (a) State and prove Poynting's theorem clearly explaining the significance of each terms 7

(b) In free space $\vec{H}=H_o\, e^{j(\omega t+\beta z)-\hat{a}x}$ calculate electric field $\vec{E}$. 7

5. (a) Define the term skin depth and explain its physical significance. 7

(b) State and explain Faraday's laws of electromagnetic induction. Also derive its expression in the integral form. 7

6. (a) A transmission line has series inductance of 0.56 mH/km & capacitance of 0.1 μF/km. If the losses due to conductor resistance and insulation leakage are negligible. Calculate. 7

(i) Characteristic impedance

(ii) The phase velocity.

(b) Show that the characteristic impedance of distortionless line is purely real. 7

7. Attempt *any two*. Write short notes on : 2x7=14

(a) Stock's theorem

(b) Electric Flux

(c) Gauss's law

(d) Magnetic dipole