01835

B.TECH. IN ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

June, 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) State and prove divergence theorem. Also discuss its applications. 7

   (b) Transform $\vec{F} = x\hat{a}_x + y\hat{a}_y + z\hat{a}_z$ into spherical co - ordinates. 7

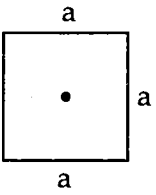
2. (a) What is Coulomb's law of electrostatic force ? Calculate the electrostatic force with which two protons in a nucleus of iron repel each other. Assume a separation of 4.0×10^{-15} m between protons. 7

   (b) Find the energy stored in the uniform electric field of a charged spherical shell of total charge "Q" and radius "r". 7

3. (a) Derive magnetic boundary conditions at magnetic surfaces. 7

(b) A square of edge "a" carries a current I. Show that the value of B at the centre is given by, 7

$$B=\frac{2\sqrt{2}\mu I}{\pi a}$$



4. (a) Explain the physical significance of curl, gradient and divergence and also if 7

$\vec{F}=x^2 y\,\hat{a}_x+(x-y)\hat{a}_z$. Calculate $\nabla\times F$.

(b) Derive the Maxwell's equations in integral form. 7

5. (a) Using Maxwell's equations, show that the free space wave equation in E is 7

$$\nabla^2 E-\mu_0\epsilon_0\frac{\partial^2 E}{\partial t^2}=0$$

(b) In free space if $\vec{H}(z,t)=1.0e^{j(1.5\times10^8 t+\beta z)}\hat{a}x$ 7

Calculate the expression for $\vec{E}(z,t)$ and determine the direction of propagation.

6. (a) Calculate the characteristic impedance of a coaxial line at 100MHz when the primary constants of a line are 0.098 Ω/m, 1.5×10^{-6} mho/m, 0.32 $\mu H/m$ and 3.45 PF/m. 7

(b) Explain the term standing waves on a transmission line. What is a pure standing wave ? 7

7. Write short notes on the following : (Attempt ***any two***) **7x2=14**

(a) Ampere's law

(b) Method of images

(c) Displacement Current

(d) Polarization