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BIEE-009

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

Term-End Examination

00143

December, 2016

BIEE-009 : APPLIED ELECTROMAGNETICS

Time : 3 hours *Maximum Marks : 70*

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

1. (a) State and prove divergence theorem. Also discuss its applications. 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-ordinates. 7

2. (a) State and explain Ampere's Circuital Law. Describe any two applications of Ampere's circuital law. 7

(b) Derive the expressions for energy stored and energy density in a magnetic field. 7

3. (a) An open wire transmission line has $R = 4{\cdot}5\ k\Omega$, $L = 0{\cdot}15$ mH, $G = 60$ mmho, $C = 12$ nF. Operating frequency = 6 MHz and the length of the transmission line is 300 m. Find propagation constant (r), characteristic impedance (Z_0) and velocity of propagation (v_p). 7

(b) Explain Standing-Wave Ratio and Reflection coefficient with reference to EM wave. 7

4. (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 integral form. 7

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

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

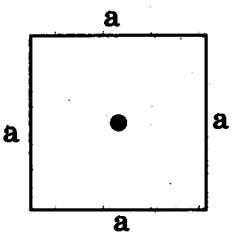
calculate $\nabla \times \vec{F}$. 7

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

6. (a) Derive the 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

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



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

(a) Electric Flux

(b) Stokes' Theorem

(c) Laplace and Poisson's Equations

(d) Reflection Coefficient