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BIEE-009

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

00373

Term-End Examination

June, 2018

BIEE-009 : APPLIED ELECTROMAGNETICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. Assume the necessary data, if not given in the question. Symbols have their usual meanings. Use of scientific calculator is permitted.*

1. (a) Derive continuity equation for time varying fields. Explain its significance in electromagnetics. 7

(b) Why is stub machine required in transmission lines ? Explain the principle of single and double stub matching. 7

2. (a) Explain physical interpretation of

(i) Gradient of a scalar

(ii) Divergence of Vector

Give their applications in electromagnetics. 7

(b) Explain the concept of polarization in dielectric materials. 7

3. (a) State boundary relations for

(i) Electric field

(ii) Magnetic field

across a common boundary separated by two different media. 7

(b) State Maxwell's equations in their general time varying form in

(i) Differential form

(ii) Integral form

Specialize these equation for :

(i) good conductors and good dielectrics

(ii) time harmonically varying fields

(iii) static fields. 7

4. (a) Given that $\vec{F} = \frac{A}{r^4} \cdot \sin^2 \phi \, \hat{i}r$, evaluate both sides of divergence theorem for regions between spherical surface r = 2 and r = 4. 7

(b) State and explain Biot Savart's law as applicable for different current densities. 7

5. (a) Define the following as they are used in electromagnetic waves : 7

(i) Propagation constant

(ii) Wavelength

(iii) Transverse wave

(iv) Skin depth

(b) Find characteristic impedance and propagation constant for a transmission line having the following parameters : 7

$r = 80\ \Omega/km$, $G = 1{\cdot}5 \times 10^{-6}$ mho/km,
frequency = 1,000 Hz, $C = 0{\cdot}06\ \mu F/km$,
$L = 0{\cdot}015$ H/km

6. (a) Differentiate between : 7

(i) Transmission lines and Cables

(ii) Lossless line and Distortionless line

(b) Explain the following : 7

(i) Mismatch line

(ii) Quarter wave transformer

7. A vector field is given by

$$\vec{B} = \hat{a}_z \frac{\cos\phi}{r}.$$

Verify Stokes theorem for a segment of a cylindrical surface defined by 14

$$r = 2,\ \frac{\pi}{3} \le \phi \le \frac{\pi}{2},\ 0 \le z \le 3.$$
