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B.Tech. ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

June, 2013

BIEL-006 : ELECTROMAGNETIC FIELD THEORY

Time : 3 hours *Maximum Marks : 70*

Note : *All questions carry **equal** marks. Attempt **any seven** questions out of **Ten** questions. Use of scientific calculator is **allowed***

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1. (a) Discuss the experimental low of Coulomb's for two charged particles. 5

(b) Prove that the field of a sheet of charge is $\boxed{E = \frac{\rho_S}{2\epsilon_0} a_N.}$ Where ρ_s is surface charge density, and a_N is unit vector. 5

2. (a) Consider two vectors A and B, where $A = 4\,\vec{a}_y + 10\,\vec{a}_z$ and $B = 2\,\vec{a}_x + 3\,\vec{a}_y$ determine the projection of A on B 5

(b) Determine the angle between two vector A and B. if : 5

$$A = 2\,\vec{a}_x + \vec{a}_y \quad B = 2\vec{a}_x + 2\vec{a}_y - 2\vec{a}_z$$

3. Consider three points P (1, −3, 5) Q (2, 4, 6) and R (0, 3, 8) are in cartesian coordinates. Determine
   (a) The distance vector VQR. **2x5=10**
   (b) The area of triangle PQR.

4. Discuss the divergence of a vector field. **10**

5. Derive the expression for energy stored in a capacitor, when an electric field E is present. **10**

6. State and explain poynting theorem. **10**

7. In a lossless transmission line prove that the propagation constants $\alpha = 0$ and $\beta = w\sqrt{LC}$ **10**

8. A transmission line has characteristic impedance of 75 ohm and a phase constant of 3rad/m at $100MH_z$. Determine the capacitance and inductance of the line per meter **10**

9. Prove that the skin depth in a good conductor is **10**

$$\delta = \frac{1}{\sqrt{2\pi f \mu \sigma}}$$

10. Answer *any two* of the following : **2x5=10**
   (a) BIOT - SAVART LAW
   (b) Depth of penetration
   (c) VSWR