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**T.E. (Electrical) (Sem. – V) (New Course) Examination, 2010
ELECTROMAGNETICS**

Day and Date : Friday, 26-11-2010
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 100

- Instructions :** 1) Solve **any three** questions from Section I and Section II.
2) Assume suitable data **wherever necessary**.
3) Figures to the **right** indicates full marks.

SECTION – I

1. a) Four identical point charges of $8\mu\text{c}$ are placed at four corners of square 4 m inside. Find out the total force acting of charge Q 4. **8**
- b) Prove that for surface charge distribution $\vec{E} = \frac{\rho_s}{2\epsilon_0} \hat{a}_n$. **8**
2. a) State and explain Coulomb's law and also explain electric field intensity and flux density. **8**
- b) Two identical uniform charges lie along the X and Y axis with charge densities $15\mu\text{c/m}$. Obtain \vec{D} at point P(2, 3, 4). **8**
3. a) State and explain Potential Gradient and derive the equation of potential gradient in Cartesian co-ordinate system. **8**
- b) If $V = 100 \sin \theta / r^2$ in the free space and point P is located at $(2, 45^\circ, 30^\circ)$ then find \vec{E} at point P. **8**
4. a) Derive the expression of capacitance of
- i) Between few plates. **4**
 - ii) Co-axial cable. **6**

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- b) A capacitor is to be constructed from two metallic plates each 2 cm^2 in area separated by 2 mm. Given $1.5 \times 10^{-3} \text{ m}^3$ of a dielectric material with $\epsilon_r = 4$, how should the dielectric be used to maximize the capacitance between the plates? What is C_{max} ? 8

SECTION – II

5. p) State and explain Ampere's Circuit law and hence prove that 8
- $$\vec{H} = \frac{I}{2\pi r} \hat{\phi} (a < r < b).$$
- q) Find \vec{H} at the centre of a square current loop of side 4 meters and a current of 5 amp is passing through it. 8
6. p) Find the flux crossing the plane surface defined by $0.5 \leq r \leq 2\text{m}$. and $0 \leq z \leq 3\text{m}$. 8
- if $\vec{B} = \left(\frac{4}{r}\right) \hat{\phi}$ Tesla.
- q) State and explain Lorentz force equation. 8
7. p) Show that the displacement current inside the dielectric of parallel plate capacitor is equal to the current flowing through the leads of the capacitor. 8
- q) Derive the expression of wave equation for free space in terms of \vec{D} , \vec{E} , \vec{B} , \vec{H} . 8
8. p) Derive the expression of input impedance of a Transmission line. 9
- q) Explain :
- i) Single stub ii) Double stub matching. 9
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