S.E. Sem 4 (Rev.) ExTC Electromagnetic Wave Theory 10/6/08

Con. 2671-08. CO-9814

(REVISED COURSE)

(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume any **suitable** data if **necessary**.
(4) **Figures** to the **right** indicate **full** marks.

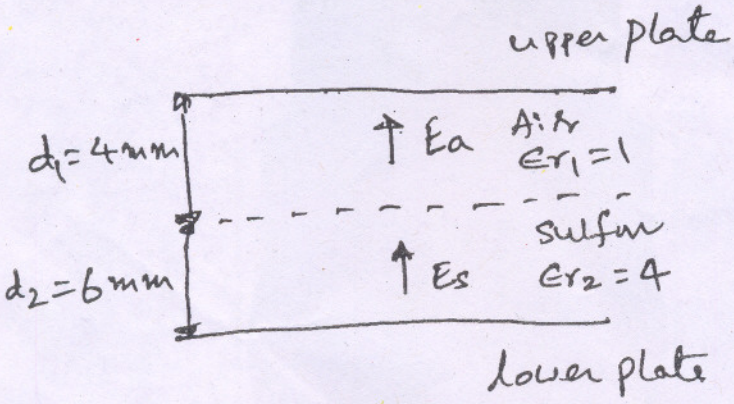
1. Explain the following : 20
   (a) Continuiting equation
   (b) Method of images
   (c) Polarization of EM waves
   (d) Scalar and vector potentials.

2. (a) Derive an expression for electric field intensity due to an infinite line charge. 10
   (b) A charge configuration is given by 10
   $\rho_V = 5\ \Omega\ e^{-2\Omega}\ c/m^3$. Find $\bar{D}$ using Gauss's law.

3. (a) Given that $\bar{A} = 30\ e^{-\Omega}\bar{a}_r - 2z\ \bar{a}_z$ in cylindricxal co-ordinate. Evaluate both sides of the divergence theorem for the volume enclosed by r = 2, z = 0 and z = 5. 10
   (b) Find the work done in moving point charge Q = 5 micro from the origin to (2m, $\pi/4$, $\pi/2$), special co-ordinates in the field 10

$$\bar{E} = 5\ e^{-\frac{r}{4}}\ \bar{a}_r + \frac{10}{r\sin\theta}\ \bar{a}_\phi\ V/M$$

4. (a) State and explain the boundary conditions for electro-magnetics. 10
   (b) Find the total capacitance if plates are square with 500 mm side shown below : 10



5. (a) Using Biot-Savarts law derive an expression for $\bar{H}$ due to an infinite long straight filament carrying a current of 'I' amp 10
   (b) Find the potential function and the electric field itensity for the region between two concentric right circular cylinders, where V = 0 at r = 1 mm and V = 150 V at r = 20 mm neglect fringing. 10

6. (a) State and explain Maxwells equation in integral and point form free space. 10
   (b) $\bar{H} = H_x\ (wt - \beta z)\ \hat{a}_x$ exists within a dielectric of permittivity ϵ. Estimate the corresponding displacement current density and then find the charge density. Electric field corresponding to $\bar{H}$ field. 10

7. (a) Define poynting vector. Obtain the integral form of poynting theorem and explain each of the terms. 10
   (b) Starting form Maxwell's equations derive the wave equation for free space. 10
