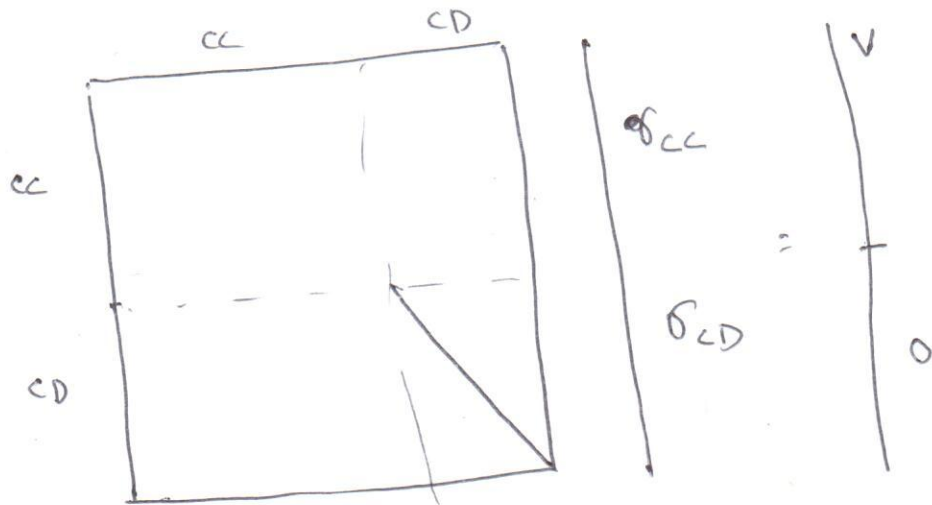


E8202 Class 6

$$E^{\pm} = \frac{1}{4\pi\epsilon_0} \sum_{j=1}^J \int_{s'} \left(\sigma_T(r') \frac{\mathbf{r}-\mathbf{r}'}{|\mathbf{r}-\mathbf{r}'|^3} \right) ds' \pm n \frac{G_T(r)}{2\epsilon_0}$$

$$\epsilon^+ E^+(\mathbf{r}) \cdot \mathbf{n} = \epsilon^- E^-(\mathbf{r}) \cdot \mathbf{n}$$

$$\frac{(\epsilon^+ + \epsilon^-)}{2\epsilon_0 (\epsilon^+ - \epsilon^-)} \sigma_T(r) + \frac{1}{4\pi\epsilon_0} \sum_{j=1}^J \int_{s'} \left(\sigma_T(r') \frac{(\mathbf{r}-\mathbf{r}') \cdot \mathbf{n}}{|\mathbf{r}-\mathbf{r}'|^3} \right) ds' = 0$$



Dielectric electrostatics.

Electric Field Integral eqⁿ :- PEC

Boundary condⁿ :-

$$n \times E = 0 \quad \text{on PEC}$$

$$E_{\text{tot}} = E_{\text{sc}} + E_{\text{inc}}|_{\text{tan}} = 0.$$

Equation :-

$$\begin{aligned} \nabla \times E &= -j\omega B && \longrightarrow && E = -j\omega A - \nabla\phi \\ \nabla \times H &= j\omega D + J && \longleftarrow && \\ \nabla \cdot D &= \rho && \longleftarrow && \\ \nabla \cdot B &= 0 && \longrightarrow && B = \nabla \times A \end{aligned}$$

$\nabla \cdot A = -j\omega \mu \epsilon \phi$
Lorentz Gauge

$$\begin{aligned} &\longrightarrow (\nabla^2 + k^2) A = -\mu J \\ &\longrightarrow (\nabla^2 + k^2) \phi = -\frac{\rho}{\epsilon} \end{aligned}$$

Green's fn :-

$$G_{\phi}(r, r') = \frac{1}{4\pi\epsilon_0} \frac{e^{-jk|r-r'|}}{|r-r'|}$$

$$G_A(r, r') = \frac{\mu}{4\pi} \frac{e^{-jk|r-r'|}}{|r-r'|}$$