## Answers – Week 6

6-1 $EMF$ = Electromotive force is the work done by an $\underrightarrow{E}$ field in moving a unit charge by $\Delta\underrightarrow{S}$

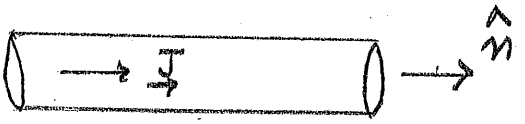
$\varepsilon = \underrightarrow{E}.\underrightarrow{\Delta S}$ measured in J/C or Volts.

6-3 $$P_E = \frac{Q^2}{2C_o} = \frac{\sigma^2 A^2 d}{2\epsilon_0 A} = \frac{\sigma^2}{2\epsilon_0} Ad = \frac{\epsilon_0}{2}\left(\frac{\sigma}{\epsilon_0}\right)^2 Ad$$

$$= \frac{\epsilon_0}{2}.E^2 \text{ (Ad) Vol. of E field}$$

$$\eta_E = \frac{P_E}{Ad} = \frac{\epsilon_0 E^2}{2}$$

6-5 $\underrightarrow{J} = 3.18x10^5\ A/m^2\ \hat{n}$




6-7 R = 54 Ω

6-9 $V_D = \dfrac{I}{\pi R^2 n_e e}$

$V_D$ decreases by a factor of 4.

6-11 $\tau$ = 2.6 x $10^{-14}$ sec

6-13 Energy generated in 1hr = 2.42 x $10^6$ J

6-15 (Power dissipated in R) = $\dfrac{\varepsilon^2 R}{(R+r)^2}$

For R → 0 it is $\dfrac{\varepsilon^2 R}{r^2} \to 0$

For R → ∞ it is $\dfrac{\varepsilon^2}{R} \to 0$