EPS Paper solution QP code : 22564

Q.2 (a)

L/R/Ph = 10Ω

Line Z/ph = 85.1Ω .

Line Y/ph = 3.125×10^{-4} S .

$V_R = 38,105$ V

$I_R = \dfrac{MW \times 10^6}{\sqrt{3} V_{RL} \cos\phi}$

$\boxed{I_R = 218.7 A}$

$V_R = (38105 + j0) V$

$\overline{I_R} = I_R(\cos\phi - j\sin\phi) = 218.7 \angle -36.87^\circ A$.

Line Z/ph = $Z(10 + j35.1) = \underline{36.5 \angle 74.1 \Omega}$

$V' = V_R + \frac{1}{2} I_R Z_R$

$\boxed{V' = 41283 + j2415 V}$

$I_C = V' \times Y$

$= (41283 + j2415) \times (j3.125 \times 10^{-4})$

$\boxed{I_C = -0.75 + j2.91 A}$

$I_S = I_R + I_C$

$\boxed{I_S = 210.62 \angle -34.175^\circ A}$

$V_S = V + \frac{1}{2} I_S Z$

$\boxed{V_S = 44500 \angle 6.3^\circ V}$

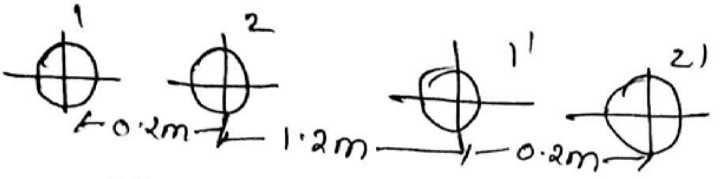
$V_{SL} = \sqrt{3} \times V_S = \sqrt{3} \times 44500 = \underline{77075 V}$

$\% V.R = \dfrac{V_{SL} - V_{RL}}{V_{RL}} = \dfrac{77075 - 66000}{66000} \times 100 = \underline{16.78\%}$

$\% \eta = \dfrac{\sqrt{3} \times V_{RL} \times I_{RL} \cos\phi_R}{\sqrt{3} \times V_{SL} I_{SL} \cos\phi} \times 100$

$\boxed{\eta = 93.5\%}$

Q. 6 (b)



$r' = 0.7788 \times r = 0.7788 \times 1.2$

$\boxed{r' = 0.93456 \text{ cm}}$

$D_m = \sqrt[4]{d_{11'} d_{12'} d_{21'} d_{22'}}$

$= \sqrt[4]{(140)(160)(120)(140)}$

$\boxed{D_m = 139.28 \text{ cm}}$

$D_s = \sqrt[4]{d_{11} d_{12} d_{21} d_{22}}$

$= \sqrt[4]{0.93456 \times 20 \times 20 \times 0.93456}$

$\boxed{D_s = 4.82 \text{ cm}}$

$L = 0.4 \log_e \frac{D_m}{D_s} \text{ mH/Km}$

$= 0.4 \log_e \left(\frac{139.28}{4.82}\right)$.

$\boxed{L = 1.3849 \text{ mH/km}}$