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Power Systems
Quiz # 1

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a) R per phase $= \frac{0.12}{3}\ \frac{\Omega}{km} * 300\,km = 12\ \Omega$ (+5) (+5)

b) $L = 2*10^{-7} \ln \frac{D_{eq}}{D_s^b}$ where (+2) (+2)

$D_{eq} = \sqrt[3]{(5)(5)(8)} = 5.848\ m$ (+2)

$D_s^b = \sqrt[3]{(GMR)*d^2} = \sqrt[3]{(0.0039)(0.25)^2}$ (+2)

$= 0.06247$

$\therefore L = 2*10^{-7} \ln \frac{5.848}{0.06247} = 9.07834*10^{-7}\ H/m$

$= 0.907834\ mH/km$ (+2)

$X_L = 2\pi f L = (2\pi)(50)(9.07834*10^{-4}\ \frac{H}{km})$

$= 0.2852\ \Omega/km$ (+2)

$= 85.56\ \Omega$

c) $C = \frac{2\pi\varepsilon_o}{\ln(\frac{D_{eq}}{D_s^b})}$ where (+2) (+13)

$D_{eq} = \sqrt[3]{(5)(5)(8)} = 5.848\ m$ (+3)

$D_s^b = \sqrt[3]{r\,d^2} = \sqrt[3]{(0.005)(0.25)^2}$ (+3)

$= 0.06786$

$\therefore C = \frac{2\pi * 8.854*10^{-12}}{\ln(5.848/0.06786)} = 12.48*10^{-12}$ (+2)

F/m

$X_c = \frac{1}{\omega C} = \frac{1}{2\pi f C} = 254.985\ M\Omega/m$ (+3)

$\frac{Y}{2} = \frac{\omega C}{2} = 1.96*10^{-9}\ S/m$

$= 5.88*10^{-4}\ S$