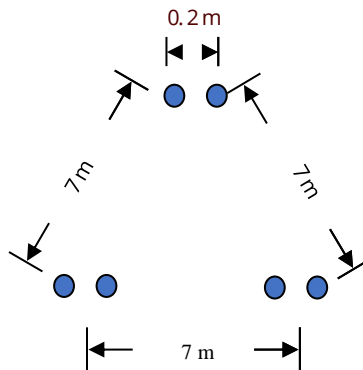


Name: _____ UIN: _____ Section: _____ Score: _____

Calculate the per phase inductance (H/m) and reactance (Ω/m) of a balanced 3 phase, 60 Hz line with equilateral phase spacing of 7m using two conductors bundling with a 0.2 m conductor spacing. The radius for each conductor is 0.023 m. (70 pts)

$$L_a = \frac{\mu_0}{2\pi} \ln \left(\frac{GMD}{GMR} \right) \quad H/m \quad \mu_0 = 4\pi \times 10^{-7} H/m$$

$$GMD = \sqrt[3]{D_{ab}D_{ac}D_{bc}} \quad GMR = \sqrt{d \times r'} \quad r' = e^{-\frac{1}{4}} \times r$$



$$r' = e^{-\frac{1}{4}} r = (.7788)(.023m) = 0.0179 \text{ m}$$

$$GMR = \sqrt{(0.2m)(0.0179m)} = 0.0599 \text{ m}$$

$$L_a = \frac{\mu_0}{2\pi} \ln \left(\frac{D_m}{GMR} \right) = 2 \times 10^{-7} \ln \left(\frac{7m}{0.0599m} \right) = 9.522 \times 10^{-7} \text{ H/m}$$

$$X_a = \omega L_a = 2\pi 60 (9.522 \times 10^{-7}) = 0.0003589 \text{ } \Omega/m$$