



12

MAK 206 Strength of Materials – 2016-2017 Spring

QUIZ 3

10/02/2017

Ad-Soyad : Selçuk Uzel

Prof.Dr. M.Ali Güler

No : 131501042**!!!!!!! 10 Minutes !!!!!!!**

The column is constructed from high-strength concrete and four A-36 steel reinforcing rods. If it is subjected to an axial force of 1000 kN, determine the required diameter of each rod so that two-fifth of the load is carried by the concrete and three-fifth by the steel.

Does the result really make sense for this problem? Why? (Bonus +2 points)

$$E_{st} = 240 \text{ GPa} \quad \& \quad E_c = 30 \text{ GPa}$$

$$1000 \cdot \frac{2}{5} = 400 \text{ kN (concrete)} \quad \checkmark$$

$$1000 \cdot \frac{3}{5} = 600 \text{ kN (steel)} \quad \checkmark$$

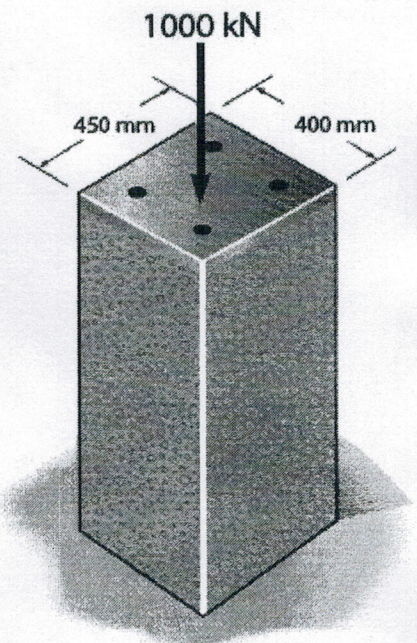
$$A_c = (400)(450) - \cancel{4} \pi \frac{D^2}{4}$$

$$A_{st} = \cancel{4} \pi \frac{D^2}{4}$$

$$\sigma_c = \sigma_{st} = \frac{(\cancel{4} \times 10^5) \cancel{\Delta}}{(\cancel{30} \times 10^9)((0.4)(0.45) - \pi D^2)} = \frac{(\cancel{6} \times 10^5) \cancel{\Delta}}{(\cancel{240} \times 10^9)(\pi D^2)}$$

$$9.63 \times 10^5$$

$$960 \pi D^2 = 32.4 - 180 \pi D^2 \Rightarrow D = 0.095 \text{ m} \quad \checkmark$$



it makes sense geometry allows steel rods to have a diameter of 0.095 m. \checkmark