

Quiz 1 answer

Table 8-11: $S_p = 600$ MPa

$$\text{Eq. (8-30): } F_i = 0.9A_t S_p = 0.9(245)(600)(10^{-3}) = 132.3 \text{ kN}$$

Table (8-15): $K = 0.18$

$$\text{Eq. (8-27) } T = 0.18(132.3)(20) = 476 \text{ N} \cdot \text{m Ans.}$$

Washers: $t = 3.4$ mm, $d = 20$ mm, $D = 30$ mm, $E = 207$ GPa $\Rightarrow k_1 = 42\,175$ MN/m

Cast iron: $t = 20$ mm, $d = 20$ mm, $D = 30 + 2(3.4) \tan 30^\circ = 33.93$ mm,

$$E = 135 \text{ GPa} \Rightarrow k_2 = 7885 \text{ MN/m}$$

Steel: $t = 20$ mm, $d = 20$ mm, $D = 33.93$ mm, $E = 207$ GPa $\Rightarrow k_3 = 12\,090$ MN/m

$$k_m = (2/42\,175 + 1/7885 + 1/12\,090)^{-1} = 3892 \text{ MN/m}$$

Bolt: $l = 46.8$ mm. Nut: $H = 18$ mm. $L > 46.8 + 18 = 64.8$ mm. Use $L = 80$ mm.

$$LT = 2(20) + 6 = 46 \text{ mm}, \quad ld = 80 - 46 = 34 \text{ mm}, \quad lt = 46.8 - 34 = 12.8 \text{ mm},$$

$$A_t = 245 \text{ mm}^2, \quad A_d = \pi(20)^2/4 = 314.2 \text{ mm}^2$$

$$k_b = A_d A_t E$$

$$A_d l_t + A_t l_d$$

$$= 314.2(245)(207)$$

$$314.2(12.8) + 245(34)$$

$$= 1290 \text{ MN/m}$$

$$C = 1290/(1290 + 3892) = 0.2489, \quad S_p = 600 \text{ MPa}, \quad F_i = 132.3 \text{ kN}$$

$$n = S_p A_t - F_i$$

$$C(P/N)$$

$$= 600(0.245) - 132.3$$

$$0.2489(15/4)$$

$$= 15.7 \text{ Ans.}$$