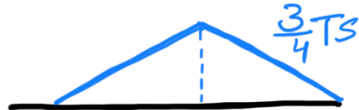
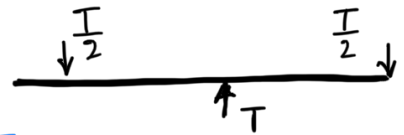
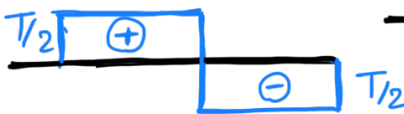
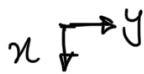
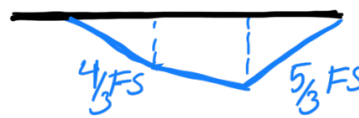
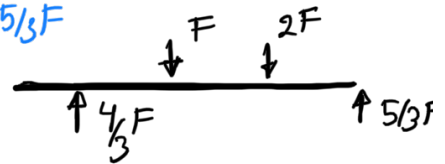
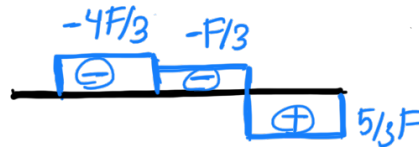
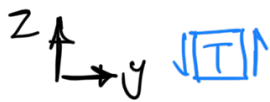
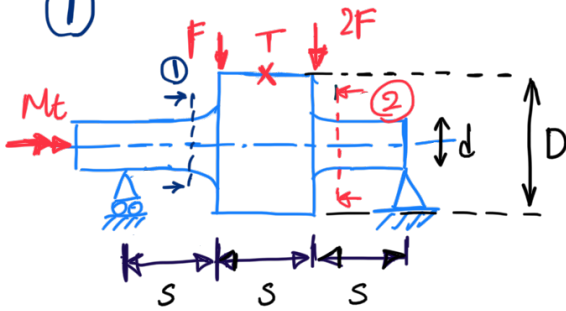


ES. 4

①



②

Verifica Statica
a) Sezione 1

$$M_{F_{tot}} = \sqrt{M_{F_x}^2 + M_{F_z}^2} = \sqrt{\left(\frac{4}{3}Fs\right)^2 + \left(\frac{1}{2}Ts\right)^2}$$

$$= 401386 \text{ Nmm}$$

$$\sigma_{F_{tot}(\text{nom})} = \frac{32 M_{F_{tot}}}{\pi d^3} = 63.91 \text{ Mpa}$$

$$M_t = \frac{TD}{2} \rightarrow \tau = \frac{16 M_t}{\pi d^3} = 19.11 \text{ Mpa}$$

$$K_{tf} = 1.7 \rightarrow \sigma_{max} = 108.65 \text{ Mpa}$$

$$K_{tt} = 1.5 \rightarrow \tau_{max} = 28.66 \text{ Mpa}$$

Verifica prima plasticizzazione:

$$\sigma_{GT} = \sqrt{\sigma_{max}^2 + 4\tau_{max}^2} = 122.85 \text{ Mpa} \rightarrow y_{GT} = \frac{R_{sn}}{\sigma_{GT}} = 4.72$$

$$\sigma_{VM} = \sqrt{\sigma_{max}^2 + 3\tau_{max}^2} = 119.46 \text{ Mpa} \rightarrow y_{VM} = \frac{R_{sn}}{\sigma_{VM}} = 4.85$$

Verifica plasticizzazione totale:

$$K_s = 1 \rightarrow \sigma_{GT} = \sqrt{\sigma_{nom}^2 + 4\tau_{nom}^2} = 74.47 \text{ Mpa} \rightarrow y_{GT} = 7.79$$

$$\sigma_{VM} = \sqrt{\sigma_{nom}^2 + 3\tau_{nom}^2} = 71.97 \text{ Mpa} \rightarrow y_{VM} = 8.06$$

③ Verifica a fatica @ Sezione 1

$$\begin{array}{l} M_f \rightarrow \text{alternata} \quad \sigma_{nom} = 63.91 \text{ Mpa} \leftarrow \sigma_a \\ M_t \rightarrow \text{costante} \quad \tau_{nom} = 19.11 \text{ Mpa} \leftarrow \tau_m \end{array}$$

$$K_F = 1 + q(K_{tf} - 1) = 1.59 \quad \sigma'_{FAF} = \frac{0.5 R_m b_2 b_3}{K_F} = 203.13 \text{ Mpa}$$

$$\tau_{sn} = \frac{R_{sn}}{\sqrt{3}} = 334.86 \text{ Mpa}$$

$$\sigma_{GP}^* = \sqrt{\sigma_a^2 + \left(\frac{\sigma'_{FAF}}{\tau_{sn}}\right)^2 \tau_m^2} = \sqrt{63.91^2 + \left(\frac{203.13}{334.86}\right)^2 19.11^2} = 63.97 \text{ Mpa}$$

$$y = \frac{\sigma'_{FAF}}{\sigma_{GP}^*} = 3.175$$

Verifica a fatica @ Sezione 2

$M_f \rightarrow$ alternata

$$M_{ftot} = \sqrt{\left(\frac{5}{3} F_s\right)^2 + \left(\frac{1}{2} T_s\right)^2} = 448454 \text{ Nmm} \rightarrow \sigma_a = \frac{32 M_{ftot}}{\pi d^3} = 71.41 \text{ Mpa}$$

$$\sigma'_{FAF} = \frac{0.5 R_m b_2 b_3}{K_F} = 203.13 \text{ Mpa}$$

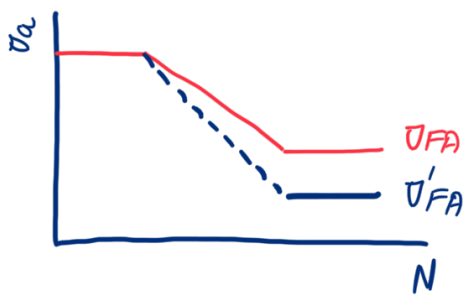
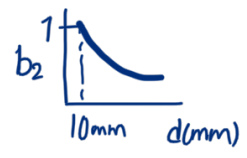
$$y = \frac{\sigma'_{FAF}}{\sigma_a} = \frac{203.13}{71.41} = 2.84$$

Es.5

$$\sigma'_{FAIF} = \frac{\sigma_{FAF} \cdot b_2 \cdot b_3}{K_F}$$

0.4 (assiale)
0.5 (fless.)

b_2 $\left\{ \begin{array}{l} \text{assiale} = 1 \\ \text{Flessionale} \end{array} \right.$



(da intendersi quei punti di riflessione)