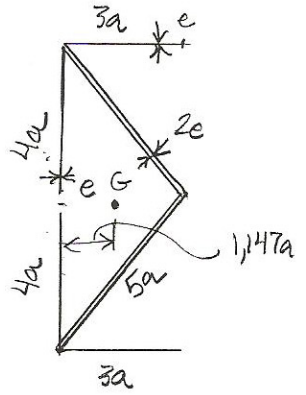


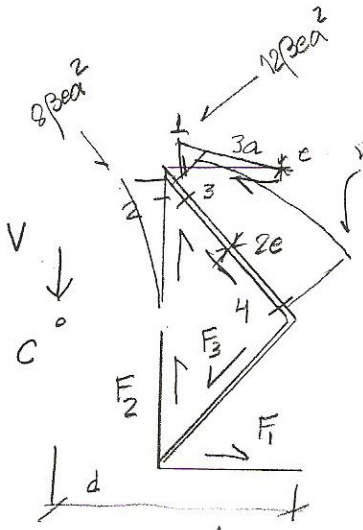
$$A = 2(3ea + 4ea + 10ea) = 34\,ea$$

$$s_G = \frac{2\left[3ea \times \frac{3}{2}a + 10ea \times \frac{3}{2}a\right]}{34ea} = \frac{39,00ea^2}{34ea} = 1,147a$$

$$I_y = 2\left[3ea \times (4a)^2 + \frac{e \times (4a)^3}{3} + \frac{2e}{0,8} \times \frac{(4a)^3}{3}\right] = \frac{736}{3}\,ea^3$$

$$I_z = 2\left[\frac{e(3a)^3}{3} + \frac{2e}{0,6}\frac{(3a)^3}{3}\right] = 78\,ea^3$$

$$I_z = 78ea^3 - 34ea \times (1,147a)^2 = 33,27\,ea^3$$



$$\bar{S}_1 = 3ea \times 4a = 12ea^2 \qquad q_1 = 12\beta ea^2 \qquad F_1 = \frac{1}{2}12 \times 3\beta ea^3 = 18\beta ea^3 \quad [0,0734\,\frac{V}{ea}]$$

$$\bar{S}_2 = 4ea \times 2a = 8ea^2 \qquad q_2 = 8\beta ea^2 \qquad F_2 = \frac{1}{3}8 \times 4\beta ea^3 = \frac{32}{3}\beta ea^3 \quad [0,0435\,\frac{V}{ea}]$$

$$\bar{S}_3 = \bar{S}_1 + \bar{S}_2 = 20ea^2$$

$$\bar{S}_4 = \bar{S}_3 + 10ea \times 2a = 40ea^2$$

$$F_3 = \left(20 + \frac{2}{3}20\right)5\beta ea^3 = \frac{500}{3}\beta ea^3 \quad [0,679\,\frac{V}{ea}]$$

verif: $2\left(F_3 \times 0,8 - F_2\right) = 2\left(\frac{500}{3} \times 0,8 - \frac{32}{3}\right)\beta ea^3 = \frac{736}{3}\,\frac{V ea^3}{\frac{736}{3}} = V$

$$Vd = 2F_1 \times 4a - 2F_2 \times 3a = \left(2 \times 18 \times 4 - 2 \times \frac{32}{3} \times 3\right)\beta ea^4 = 80\beta ea^4$$

$$Vd = \frac{80\,V ea^4}{\frac{736}{3}\,ea^3} = \frac{240}{736}Va = \frac{15}{46}Va \Rightarrow d = \frac{15}{46}a = 0,326a$$

$$\tau_{max} = \frac{q_4}{2e} = \frac{40\beta ea^2}{2e} = \frac{20\,Va^2}{\frac{736}{3}\,ea^3} = \frac{60}{736}\frac{V}{ea} = 0,0815\,\frac{V}{ea} \quad [2,77\,\tau_{med}]$$

(MT)

$$I_T = \Sigma I_{T_i} = \frac{2}{3}\left[7ae^3 + 5a(2e)^3\right] = \frac{94}{3}ae^3 = 31,33ae^3$$

$$\tau_{max} = \frac{M_T}{I_T}e_{max} = \frac{M_T}{\frac{94}{3}ae^3} \times 2e = \frac{3}{47}\frac{M_T}{ae^2} = 0,0638\,\frac{M_T}{ae^2}$$