سلم تصحيح وحل السؤال الثالث والرابع من مادة المنشآت المعدنية 1 جامعة دمشق

العلامة العظمى 30 درجة — الدورة الفصلية الأولى 2020/01/20

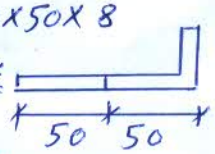
Problem 3 : (10 Marks)

6min

$A_{equal} = 1140 - (50 \times 8) = 740\ mm^2$ 1

$N_{pl,Rd} = \frac{A f_y}{\gamma_{M0}} = 740 \times 275 \times 10^{-3} = 203.5\ KN$ 1

L 100x50x 8



$d = 16 \rightarrow d_0 = 18$ 1 , $A_{net} = 740 - 1 \times 18 \times 8 = 596$ 2

$2.5 d_0 = 45 < p_1 = 60 < 5 d_0 = 90 \rightarrow \beta_3 = 0.567$ 2

$N_{u,Rd} = \frac{\beta_3 A_{net} f_u}{\gamma_{M2}} = \frac{0.567 \times 596 \times 430}{1.25} 10^{-3} = 116.25$ 2

$N_{t,Rd} = \min(N_{pl,Rd}, N_{u,Rd}) = 116.25 \geq 90$ ok 1

Problem 4: (20 Marks)

16min

$l_w = 2 \times 70 + 200 - 2 \times 7 = 326$ 1

$y' = \frac{2 \times 63 \times 31.5 + 0}{326} = 12.17$ 2

$I_z = 200 (12.17)^2 + 2\left[\frac{63^3}{12} + 63 (315 - 12.17)^2\right]$

$= 118376.04$ 2

$I_y = \frac{200^3}{12} + 2 \times 63 \left(\frac{200}{2}\right)^2 = 1926666.67$ 2

$r = \sqrt{\left(\frac{200}{2}\right)^2 + (70 - 12.17)^2} = 115.52\ mm$ 1

$\cos\varphi = \frac{70 - 12.17}{115.52} = 0.501$ 1

$F_{V_1} = \frac{F}{l_w} = \frac{F \times 10^3}{326} = 3.067\ F$ 1

$ecc = 202.9 - \frac{205.8}{2} + (70 - 12.17) = 157.83\ mm$ 1

$F_{V_2} = \frac{F \times ecc \times r}{I_p} = \frac{F \times 10^3 \times 157.83 \times 115.52}{I_z + I_y} = 8.915\ F$ 2

$F_{V,Ed} = \sqrt{F_{V_1}^2 + F_{V_2}^2 + 2 F_{V_1} F_{V_2} \cos\varphi} = 10.78\ F$ 2

$a = 0.7 S = 4.9\ mm$ 1 , $F_{w,Rd} = a f_{vwd} = 4.9 \frac{430/\sqrt{3}}{0.85 \times 1.25} = 1144.92\ N/mm$ 2

$F_{w,Rd} \geq F_{V,Ed} \Rightarrow 1144.92 \geq 10.78\ F \Rightarrow 106.21\ KN \geq F$ 2