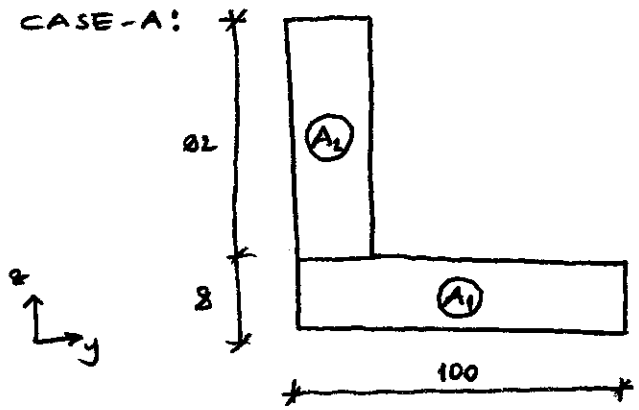
CE 388 - HW1 - Solutions

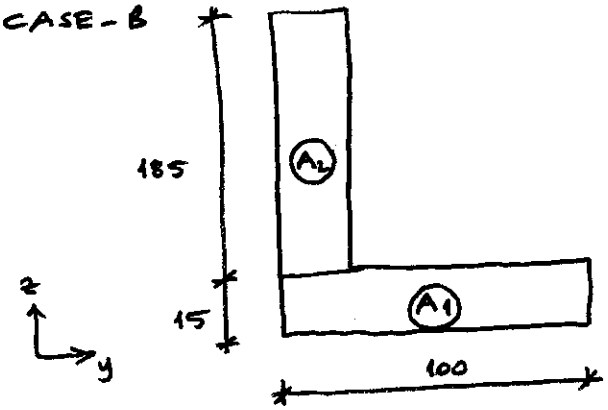
1) CASE-A:



$A_1 = 80.0\ cm^2$

$A_2 = 73.6\ cm^2$

CASE-B



$A_1 = 150.0\ cm^2$

$A_2 = 277.5\ cm^2$

J_{yz}: Product of inertia $\rightarrow$ $\tan 2\alpha = -\dfrac{2 J_{yz}}{(I_y - I_z)}$

$J_u = J_y \cos^2\alpha - 2 J_{yz} \sin\alpha \cos\alpha + J_z \sin^2\alpha$

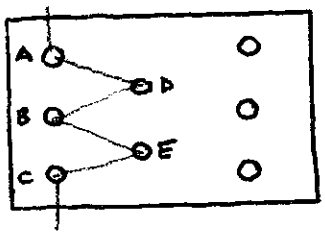
$J_v = J_z \cos^2\alpha + 2 J_{yz} \sin\alpha \cos\alpha + J_y \sin^2\alpha$

		CASE A		CASE B	
	Unit	Calculated	Tabulated	Calculated	Tabulated
y_s	cm	2.80	2.74	2.24	2.22
z_s	cm	2.80	2.74	7.24	7.16
J_y	cm^4	148.17	144.84	1767.95	1758.00
J_z	cm^4	148.17	144.84	306.07	299.10
i_y	cm	3.11	3.06	6.41	6.40
i_z	cm	3.11	3.06	2.68	2.64
α	°	45	45	14.75	14.57
J_u	cm^4	236.34	230.19	1876.96	1865.00
J_v	cm^4	60.00	59.5	197.06	193.10
i_u	cm	3.92	3.85	6.63	6.59
i_v	cm	1.98	1.96	2.15	2.12

*) The main reason for the differences between calculated and tabulated values is rounded shapes of tabulated sections.

2) Assumption-1 :

hole diameter = 16 + 1 = 17 mm



→ $\frac{T_{max}}{2}$

t = 10 mm (upper or lower plate)

A_{gross} = 23.8 cm^2

A_{ADBEC} = 22.7 cm^2 (most critical path)

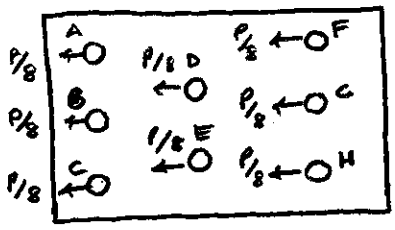
0.85 A_{gross} > A_{ADBEC} ✓

σ_{cem} = 1.44 t/cm^2

T_{max} = 65.38 t

Assumption-2 :

hole diameter = 16 + 1 = 17 mm



→ $\frac{T_{max}}{2}$ = P

t = 10 mm (upper or lower plate)

A_{gross} = 23.8 cm^2

A_{FGH} = 22.9 cm^2 → Tension load = P = $\frac{T_{max}}{2}$ in this path

0.85 A_{gross} > A_{FGH} ✓

σ_{cem} = 1.44 t/cm^2

T_{max} = 65.95 t