

Assignment 5
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Question 1

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3 metallic layers (Aluminium 7073-T6) → ③ $z = 1.25\text{mm}$
0.5 mm thick (Titanium 6V-4Al) → ② $z = 0.75\text{mm}$
(304 stainless steel) → ① $z = 0.25\text{mm}$

Modulus weighted plane Midplane

$h^* = \int_{-h/2}^{h/2} \frac{E}{E_0} dz_0$

$z_0^* h^* = \int_{-h/2}^{h/2} z_0 \frac{E}{E_0} dz_0 = \sum_i (\bar{z}_0)_i \left(\frac{E_i h_i}{E_0} \right)$

$E_1 = 200 \text{ GPa}$
 $E_2 = 114 \text{ GPa}$
 $E_3 = 71.7 \text{ GPa}$

$h^* = \int_{-h/2}^{h/2} \frac{E}{E_0} dz_0$
 $= 1(0.5) + \frac{114}{200}(0.5) + \frac{71.7}{200}(0.5)$
 $= 0.5 + 0.285 + 0.17925$
 $= 0.96425 \text{ mm}$

$z_0^* h^* = \int_{-h/2}^{h/2} z_0 \frac{E}{E_0} dz_0 = \sum_i (\bar{z}_0)_i \left(\frac{E_i h_i}{E_0} \right)$
 $= 0.25(0.5) + 0.75 \left(\frac{114}{200} \right) (0.5) + 1.25 \left(\frac{71.7}{200} \right) (0.5)$
 $= 0.125 + 0.21375 + 0.224$
 $z_0^* h^* = 0.5628125 \text{ mm}$
 $z_0^* (0.96425) = 0.5628125$
 $z_0^* = 0.583679 \text{ mm}$
 $z_0^* = 0.584 \text{ mm}$