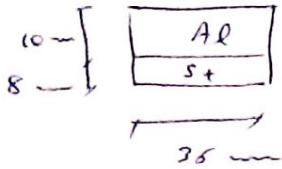


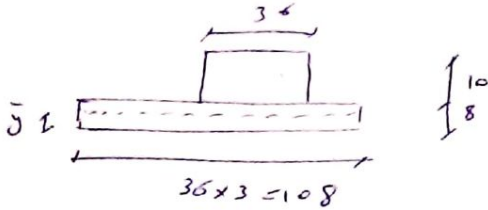
(37)

مسئله: مقطع مستطیل از فولاد و آلومینیم تحت گشتاور $M = 100 \text{ N.m}$



آلومینیم در نوک و فولاد در مرکز است؟

$$E_{St} = 210 \text{ GPa} \quad , \quad E_{Al} = 70 \text{ GPa}$$



$$\bar{y} = \frac{\sum A \bar{y}}{\sum A} = \frac{108 \times 8 \times 4 + 10 \times 36 \times 13}{36 \times 10 + 108 \times 8}$$

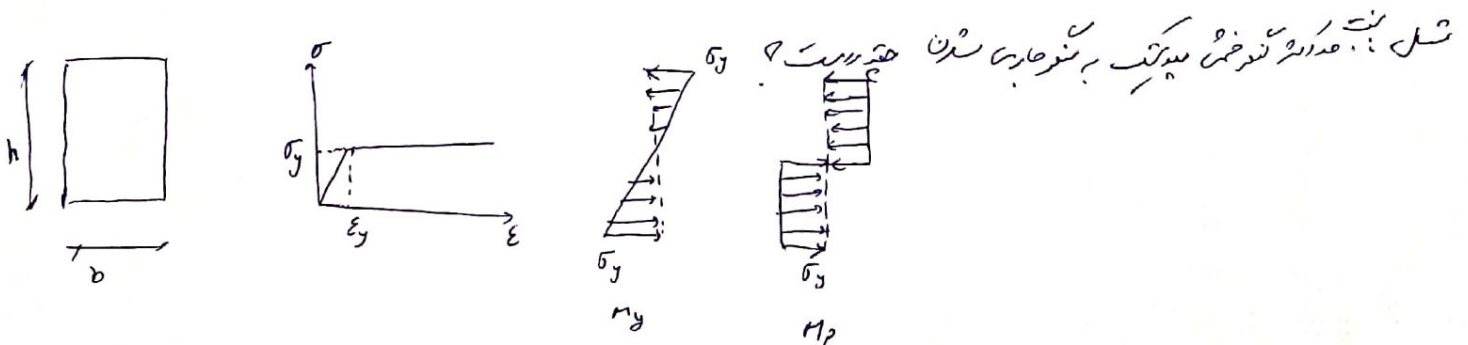
$$\bar{y} = 6.65 \text{ mm} < 8 \quad \checkmark$$

$$I = \frac{36 \times 10^3}{12} + (36 \times 10)(5 + 8 - 6.65)^2 + \frac{108 \times 8^3}{12} + (108 \times 8)(6.65 - 4)^2 = 28191.54$$

$$(\sigma_{max})_{Al} = \frac{M C_1}{I} = \frac{100 \times 10^3 \times (10 + 8 - 6.65)}{28191.54} = 40.26 \text{ MPa}$$

$$(\sigma_{max})_{St} = \frac{M C_2}{I} = \frac{3 \times 100 \times 10^3 \times (6.65)}{28191.54} = 70.77 \text{ MPa}$$

$$\frac{1}{\rho} = \frac{M}{EI} \rightarrow \rho = \frac{EI}{M} = \frac{70 \times 10^3 \times 28191.54}{100 \times 10^3} = 19.734 \text{ m}$$



$$M_y = \left[\sigma_y \times \frac{bh}{4} \right] \times 2h/3 = \sigma_y \frac{bh^2}{6}$$

$$M_x = \left[\sigma_y \times b \frac{h}{2} \right] \times \left[\frac{h}{2} \right] = \sigma_y \frac{bh^2}{4}$$

$$\Rightarrow \frac{M_x}{M_y} = \frac{3}{2} \rightarrow \begin{cases} S = \frac{bh^2}{6} \\ Z = \frac{bh^2}{4} \end{cases}$$