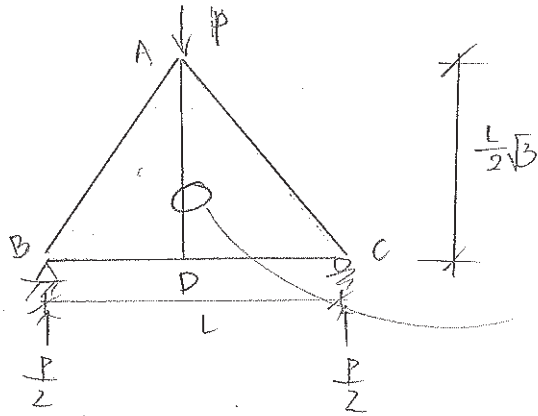


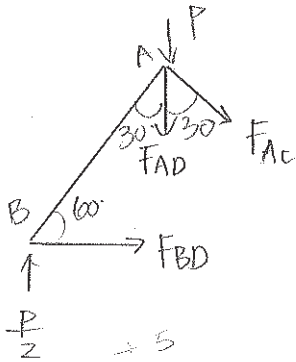
PROBLEM 1



$$\sin 30^\circ = \frac{1}{2}$$

ZERO FORCE MEMBER

REXNS ARE  $\frac{P}{2}$  BY SYMMETRY



$$\sum M_D = 0 = -\frac{P}{2} \left(\frac{L}{2}\right) - (F_{AC} \sin 30^\circ) \left(\frac{L}{2}\sqrt{3}\right) = 0 \quad + \uparrow$$

$$\frac{P}{2} - F_{AC} \frac{\sqrt{3}}{2} = 0$$

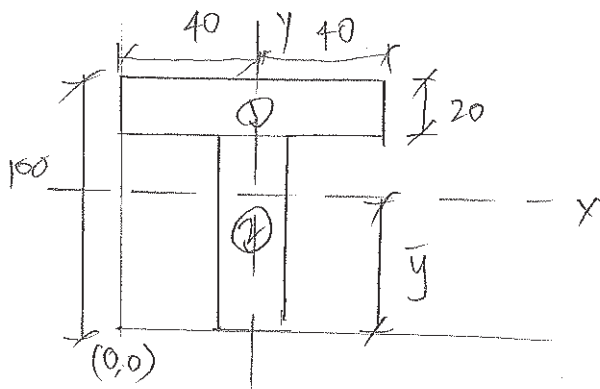
$$F_{AC} = \frac{P}{\sqrt{3}} \quad + \uparrow$$

$$\sum F_x = 0 = F_{BD} + F_{AC} \sin 30^\circ = 0 \quad + \uparrow$$

$$F_{BD} = -F_{AC} \sin 30^\circ = -\frac{F_{AC}}{2} = \frac{P}{2\sqrt{3}} \quad + \uparrow$$

$F_{AC} = \frac{P}{\sqrt{3}} \text{ (C)}$ $F_{BD} = \frac{P}{2\sqrt{3}} \text{ (T)}$
--

## PROBLEM 2



$$(A) \quad \bar{y} = \frac{\sum y_i A_i}{\sum A_i} = \frac{40(80 \times 20) + 90(80 \times 20)}{(80 \times 20) + (80 \times 20)} = 65$$

$$\bar{x} = 40 \text{ BY SYMMETRY}$$

$$(\bar{x}, \bar{y}) = (40, 65)$$

(B)

AREA ①

$$I_{x_c}^{①} = \frac{1}{12}(80)(20)^3 = 533333$$

$$I_x^{①} = I_{x_c}^{①} + A_1 d_1^2 = 533333 + (80 \times 20)(90 - 65)^2 = 10533333$$

AREA ②

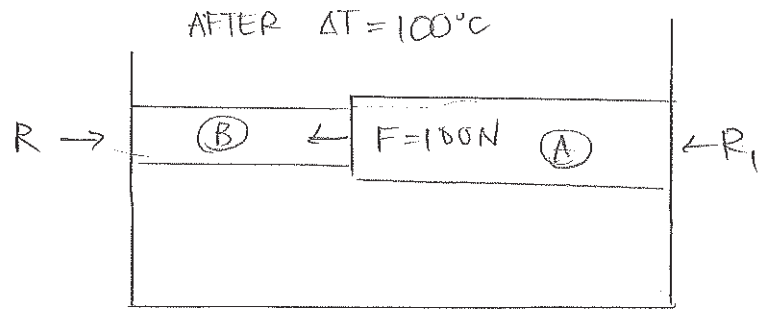
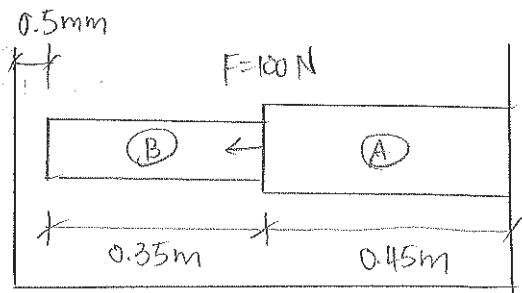
$$I_{x_c}^{②} = \frac{1}{12}(20)(80)^3 = 8533333$$

$$I_x^{②} = I_{x_c}^{②} + A_2 d_2^2 = 8533333 + (20 \times 80)(65 - 40)^2 = 18533333$$

TOTAL:

$$I_x = I_x^{①} + I_x^{②} = \underline{\underline{29066666}}$$

PROBLEM 3



(B)	(A)
$A_B = 0.0015 \text{ m}^2$	$A_A = 0.0018 \text{ m}^2$
$E_B = 105 \times 10^9 \text{ N/m}^2$	$E_A = 73 \times 10^9 \text{ N/m}^2$
$\alpha_B = 21.6 \times 10^{-6} / ^\circ\text{C}$	$\alpha_A = 23.2 \times 10^{-6} / ^\circ\text{C}$

$$\delta_T = \alpha_B \Delta T L_B + \alpha_A \Delta T L_A = (21.6 \times 10^{-6})(100)(0.35) + (23.2 \times 10^{-6})(100)(0.45) = 0.0018 \text{ m}$$

$$\delta_F = \frac{FL_A}{A_A E_A} = \frac{(100 \text{ N})(0.45 \text{ m})}{(0.0018 \text{ m}^2)(73 \times 10^9 \text{ N/m}^2)} = 3.42 \times 10^{-7} \text{ m}$$

$$\delta_R = \frac{-RL_B}{A_B E_B} + \frac{-RL_A}{A_A E_A} = -R \left( \frac{0.35 \text{ m}}{(0.0015 \text{ m}^2)(105 \times 10^9 \text{ N/m}^2)} + \frac{0.45 \text{ m}}{(0.0018 \text{ m}^2)(73 \times 10^9 \text{ N/m}^2)} \right)$$

$$= -5.65 \times 10^{-9} R \text{ m}$$

$$\delta_T + \delta_F + \delta_R = 0.0005 \text{ m}$$

$$0.0018 \text{ m} + 3.42 \times 10^{-7} \text{ m} - 5.65 \times 10^{-9} R \text{ m} = 0.0005 \text{ m}$$

$$R = 230 \text{ kN}$$

COMPRESSIVE FORCES:

in (B):

$$P_B = R = \underline{230 \text{ kN}}$$

in (A):

$$P_A = P_B - 100 \text{ N} = \underline{130 \text{ kN}}$$

STRESSES:

$$\sigma_B = \frac{P_B}{A_B} = \frac{230 \text{ kN}}{1500 \text{ mm}^2} = \underline{153 \text{ MPa}}$$

$$\sigma_A = \frac{P_A}{A_A} = \frac{130 \text{ kN}}{1800 \text{ mm}^2} = \underline{72.2 \text{ MPa}}$$

PROBLEM 4

(A) b, d

(B) a, e

(C) d

(D) a,