

# \* امتحان 1 استرکات \*

## Virtual Work.

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$$W_{ex} = W_{in}$$

$$P \times \Delta = \text{نورمال} + \text{سیر} + \text{موضعی}$$

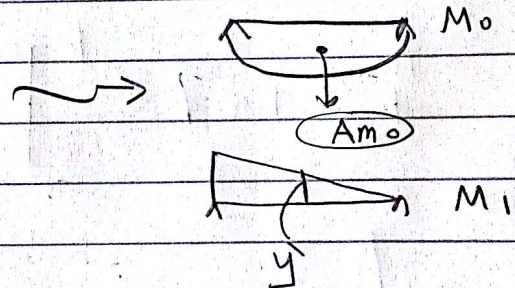
نورمال  
سیر  
موضعی

← ابعاد  $\delta$  و  $\delta$  1t

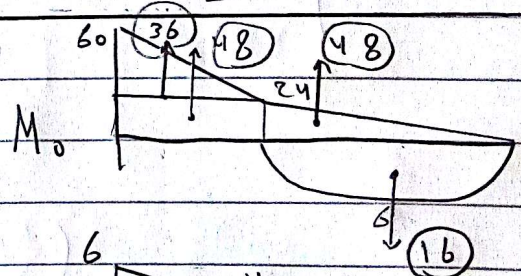
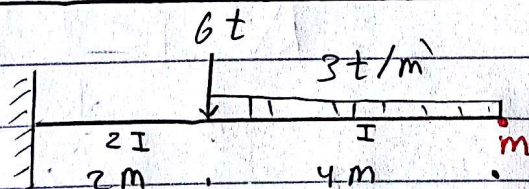
$$P \times \Delta = \int \frac{M_0 M_1}{EI} dx$$

← ابعاد  $\delta$  و  $\delta$  1t

$$\frac{A_{M_0}}{EI} \leftarrow \text{مافة } M_1 \text{ في } M_0$$

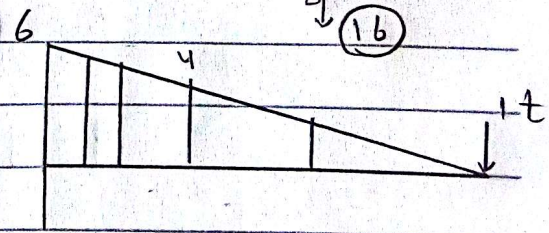


ex  
Fin  $\delta_m$



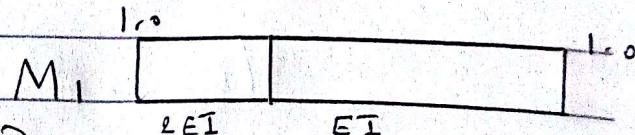
$$\delta_m = \frac{1}{2EI} [48 \times 5 + 36 \times 5.33]$$

$M_1$



$$+ \frac{1}{EI} [48 \times 2.67 - 16 \times 2] = \frac{312}{EI}$$

$$\text{Fin } \alpha_m \quad \alpha_m = \frac{1}{2EI} [48 \times 1 + 36 \times 1]$$



$$+ \frac{1}{EI} [48 \times 1 - 16 \times 1] = 47/EI$$

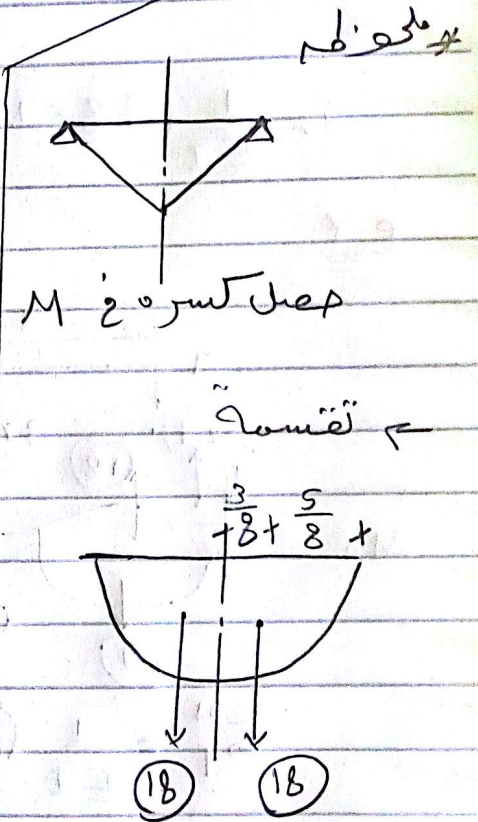
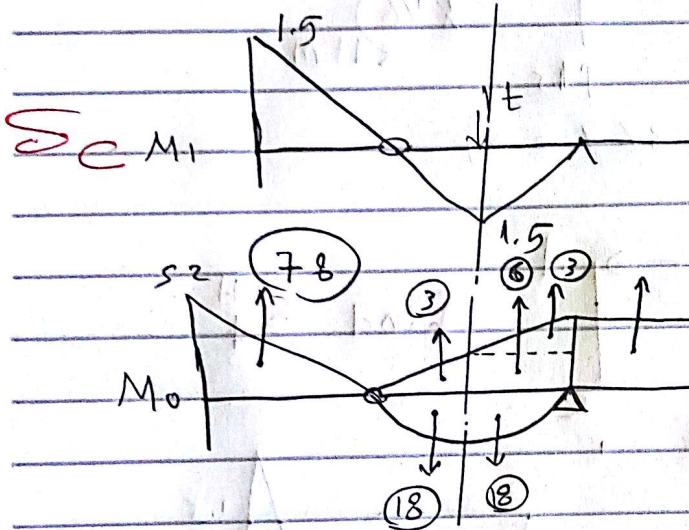
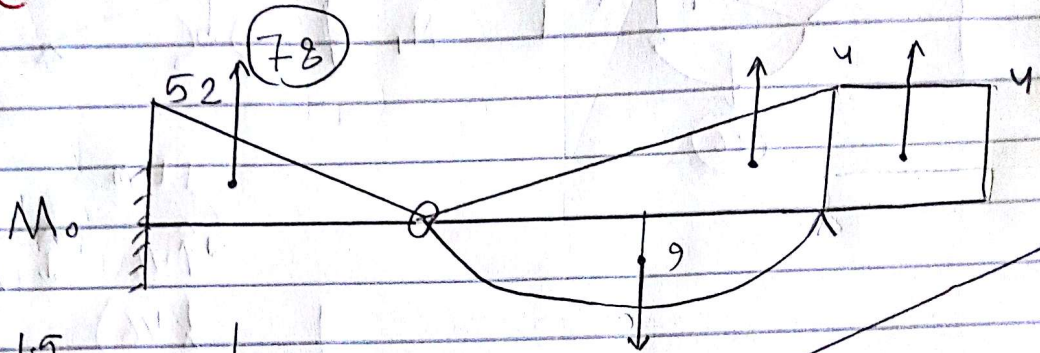
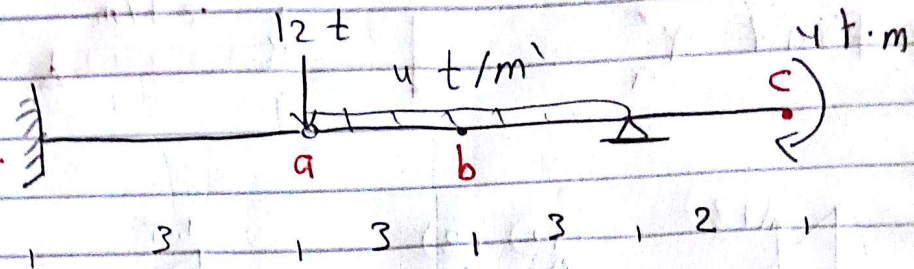


**Ex 1**

Fin  $\delta, \alpha @ b$

$\delta, \alpha @ c$

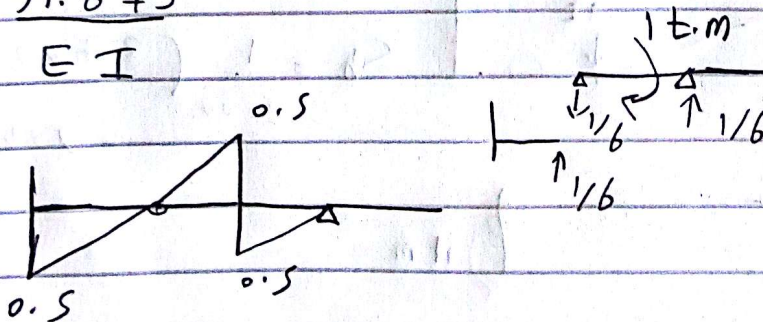
$\alpha @ a$



$$\delta_c = \frac{1}{EI} \left[ 78 \times 1 + 2 \times 18 \times \frac{5}{8} \times 1.5 - 3 \times 1 - 6 \times 0.75 - 3 \times 0.5 \right]$$

$$= \frac{91.875}{EI}$$

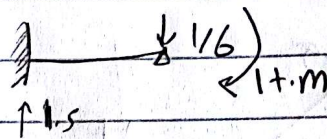
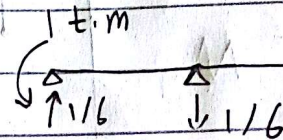
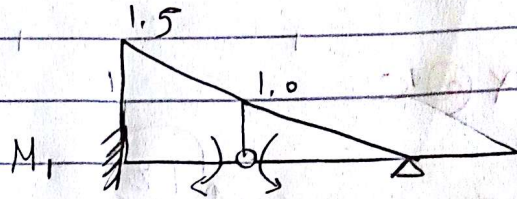
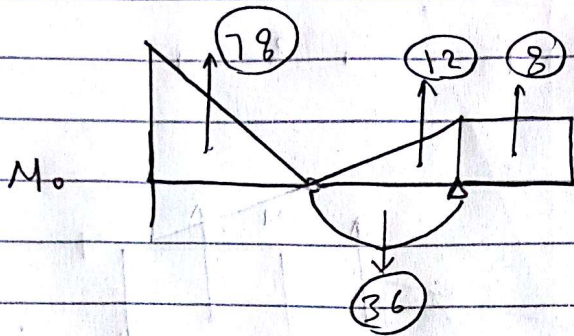
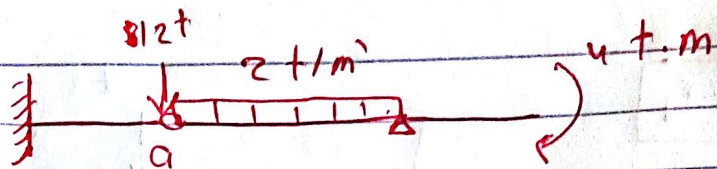
$\alpha_c$



$$\alpha_c = \frac{1}{EI} \left( 78 \times 0.33 + 3 \times 0.33 - 6 \times 0.25 - 3 \times \frac{1}{6} \right)$$

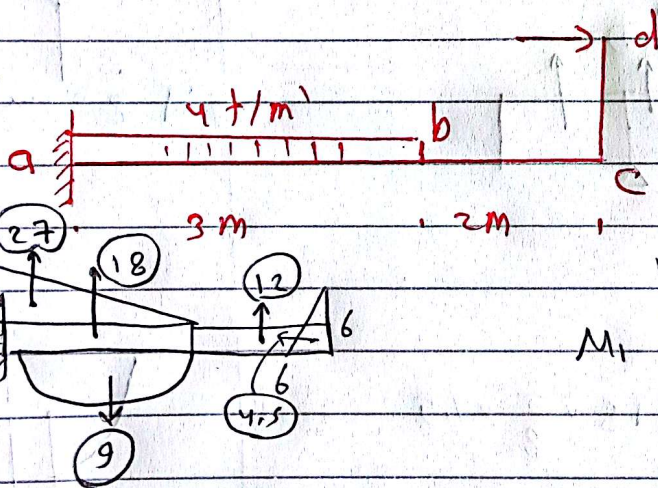


Find  $\alpha_r$



$$\alpha_r = \frac{1}{EI} (78 \times 1.67 + 12 \times 0.33 - 36 \times 0.5)$$

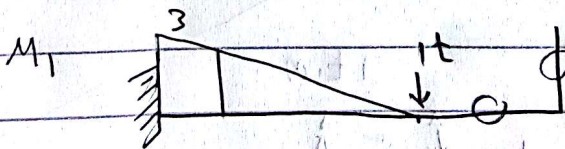
ex



Find  $\delta_d^H$

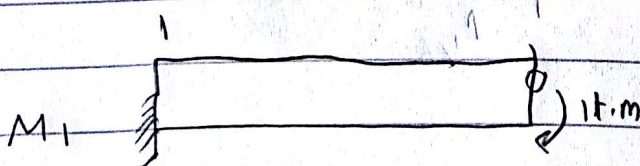
$$\delta_d^H = \frac{1}{EI} ((27 + 18 + 12 - 9 + 4.5) \times 1) = \frac{76.5}{EI}$$

$\delta_b$



$$\delta_b = \frac{1}{2000} (27 \times 2 + 18 \times 1.5 - 9 \times 1.5) = \frac{67.5}{EI}$$

$\alpha_c$



$$\alpha_c = \frac{1}{2000} (27 + 18 + 12 - 9)$$



