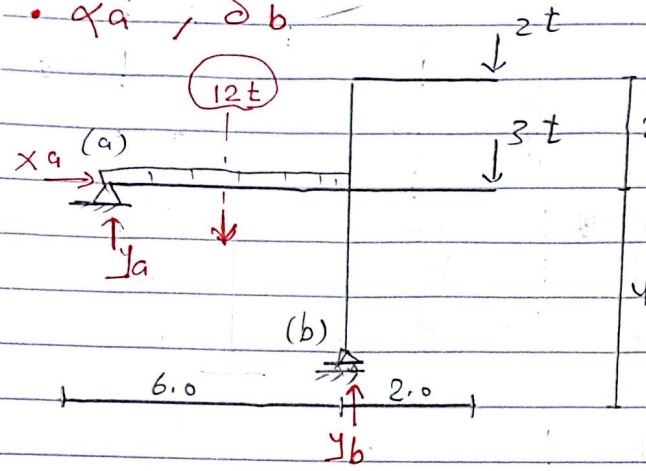
Sec

Virual Work
frame, truss

Ex ①

• α_a , δ_b^h

$EI = 8000\ m^2 \cdot t$



$$y_b = \frac{12\times3 + 2\times8 + 3\times8}{6} = 12.67\ t$$

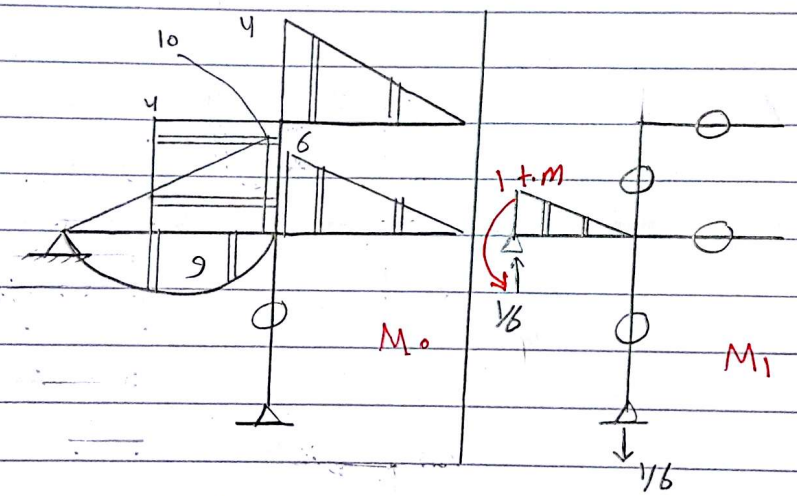
$$y_a = 4.33$$

* خطوات حل الفريم

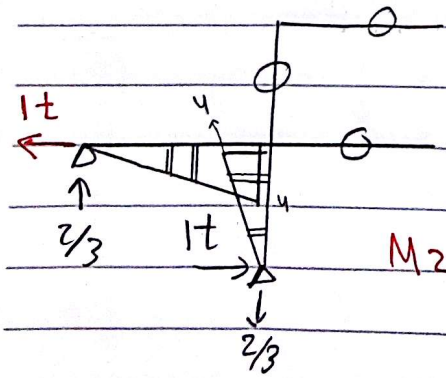
١- الكوابيل

٢- حل الفريم

٣- الكمرات



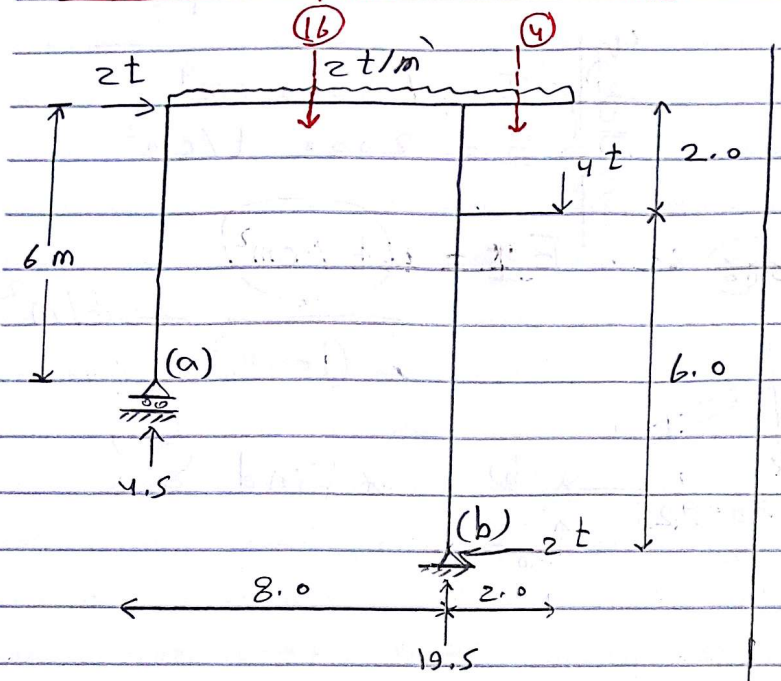
$$\alpha_a = \frac{1}{EI}\left[+\frac{1}{2}\times6\times10\times\frac{1}{3} - \frac{2}{3}\times6\times9\times\frac{1}{2}\right] = \checkmark\ Rad$$



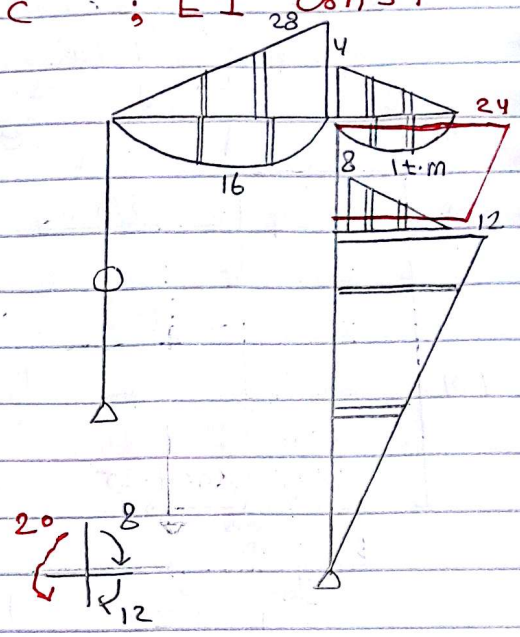
$$\delta_b^H = \frac{1}{EI}\left[-\frac{1}{2}\times6\times10\times\frac{2}{3}\times4 + \frac{2}{3}\times6\times9\times2\right] = \checkmark m$$

EX ②

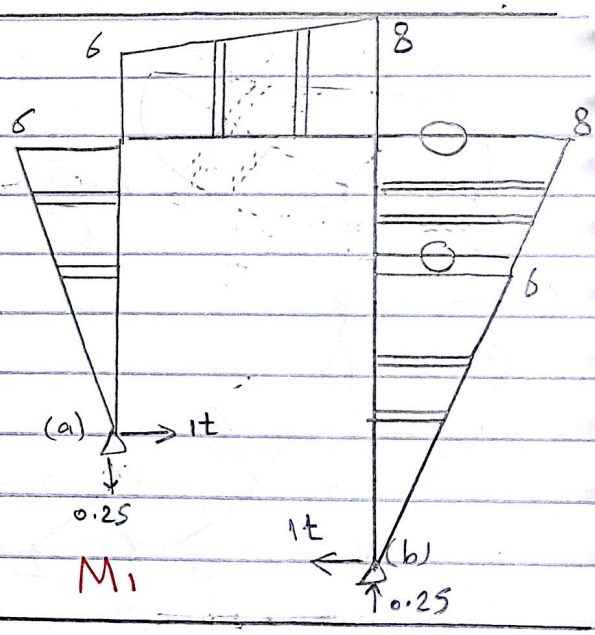
Find δ_a and α_c ; EI const



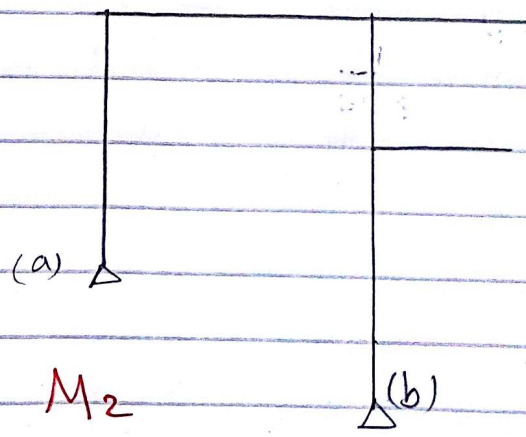
$y_b = 19.5\ t$ $y_a = 4.5\ t$



M_0

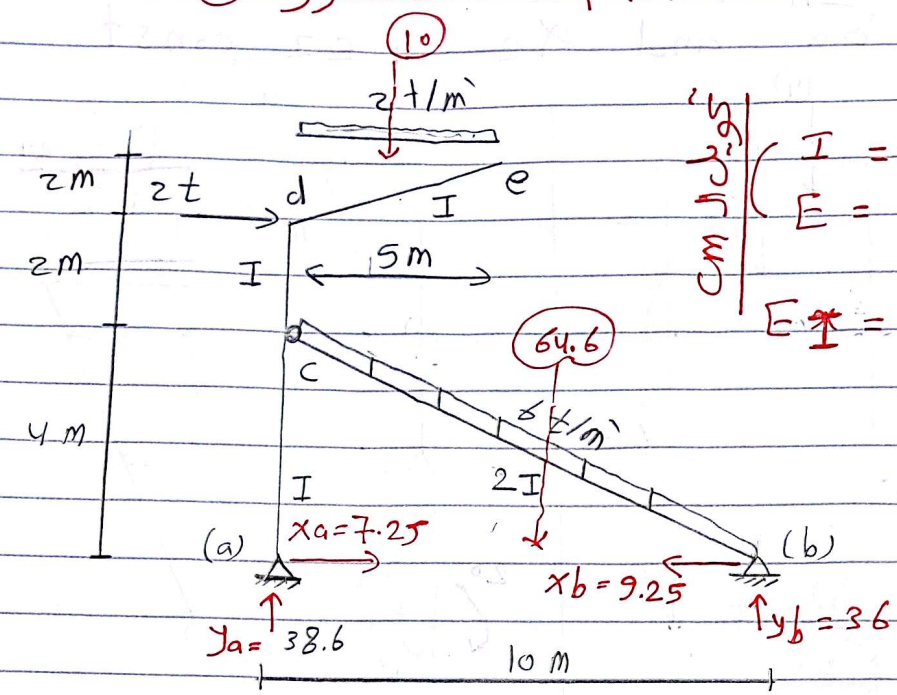


M_1



M_2

Ex (3) مشهور → famous



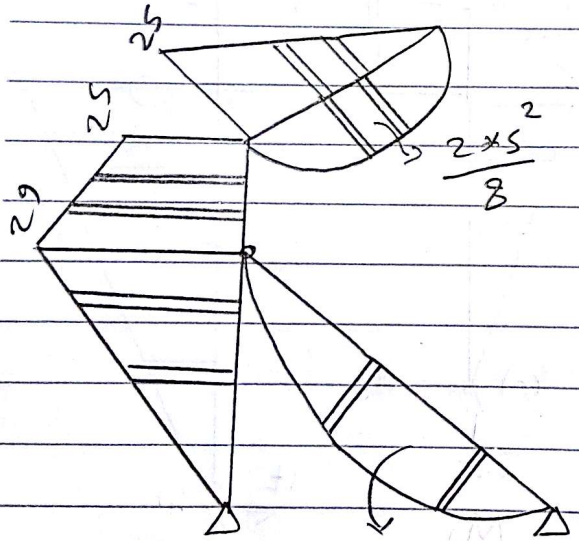
* فرضهم الاستاذ

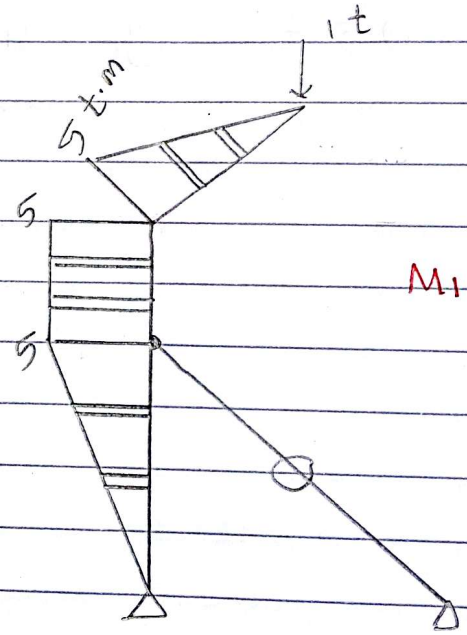
$I = 17000\ cm^4$

$E = 2000\ t/cm^2$

$EI = \frac{t/cm^2}{(100)^2} \rightarrow t/m^2$

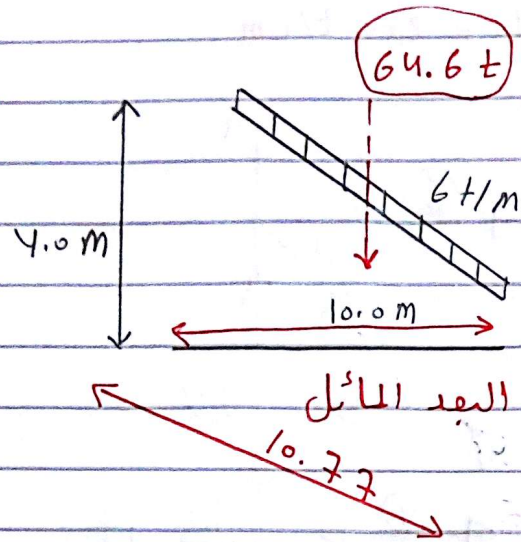
* Find δ_e^v





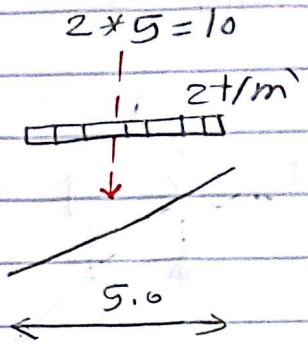
$\frac{6 * 10.77 \times 10}{8}$

[* حالات تركيز الأحمال]

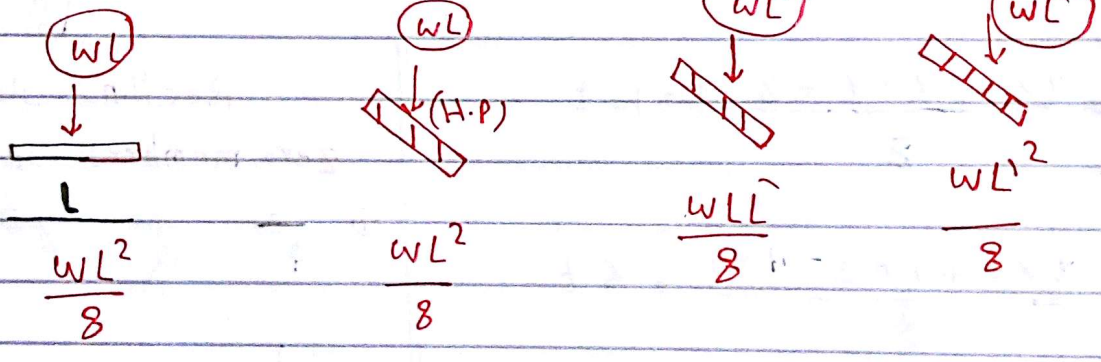


* البعد المائل

10.77

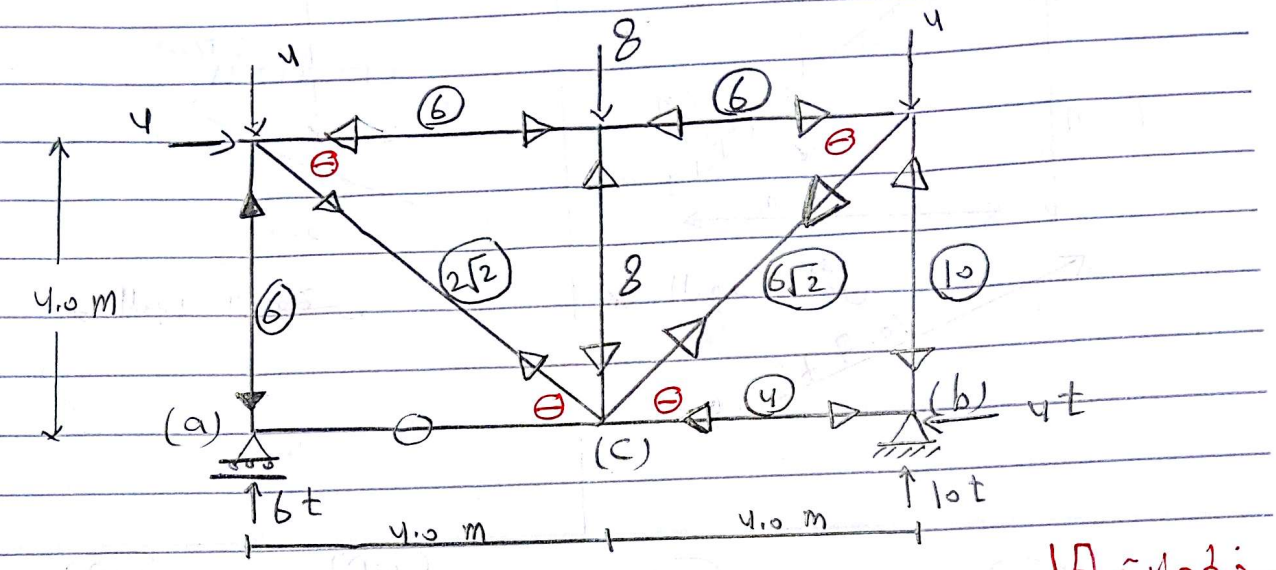


* البعد الأفقي



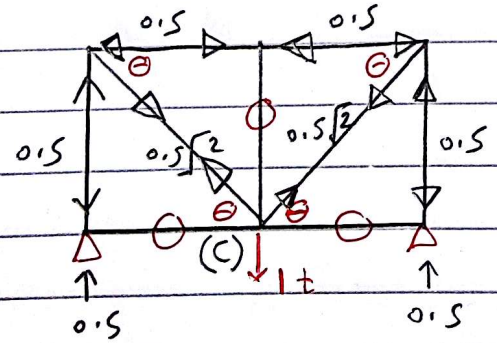
* (Truss)

Ex ① : Find δ_c^v and EA/L = 200 t/cm



$$y_b = \frac{4\times4 + 8\times4 + 8\times4}{8} = 10\ t$$

$$y_a = \frac{8\times4 + 4\times8 - 4\times4}{8} = 6\ t$$

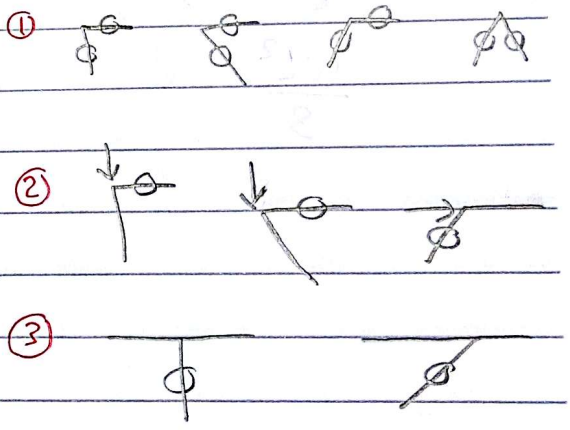


$$\delta_c^v = \frac{1}{200}\Big[0.5\times6 + 0.6\times6 + 0.5\times6 + 0.5\times10 + 2\sqrt{2}\times0.5\sqrt{2} + 0.5\sqrt{2}\times6\sqrt{2}$$

خطوات الحل

① عادة الـ Rections

② حدد الـ zero member



ملحوظة

$$1t * \delta_c^v = \sum \frac{f_0 f_1 L}{E A}$$

$$\frac{E A}{L} = 200 \ t/cm$$

* لاحظ نعوض بـ $\frac{1}{200}$