

M R
Ahmed Mahdy



فيزياء	استاتيكا
دوائر كهربية	الكثرونيات
ميكانيكا الانشآت	هيدروليكا

مدرس خصوصي

حضورى

اونلاين

بحصل الطالب علي

مقاطع فيديو هات لشرح المقرر بشكل وافى

ملخص للمادة Pdf للمذكرة والمراجعة

محاضرات مباشرة علي برنامج زووم

مناقشة الأجزاء الغير مفهومة

تواصل مستمر مع معلم المادة



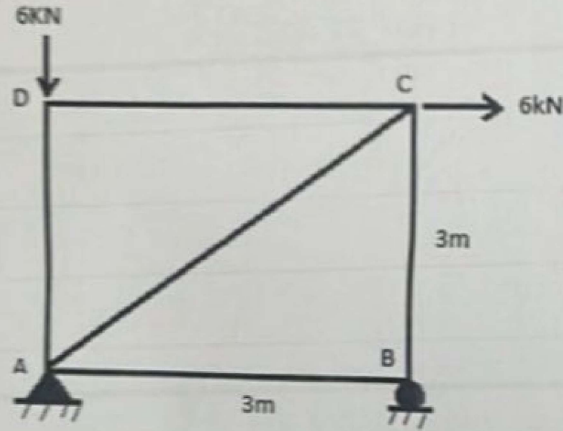
للتواصل

0567630097

0565657741

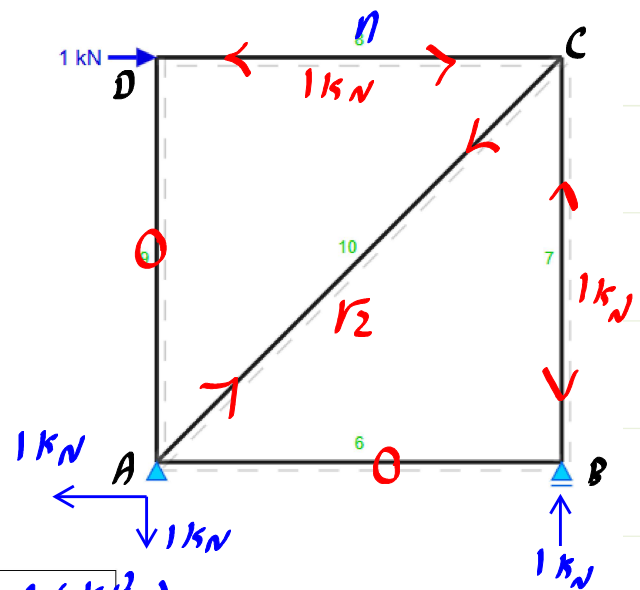
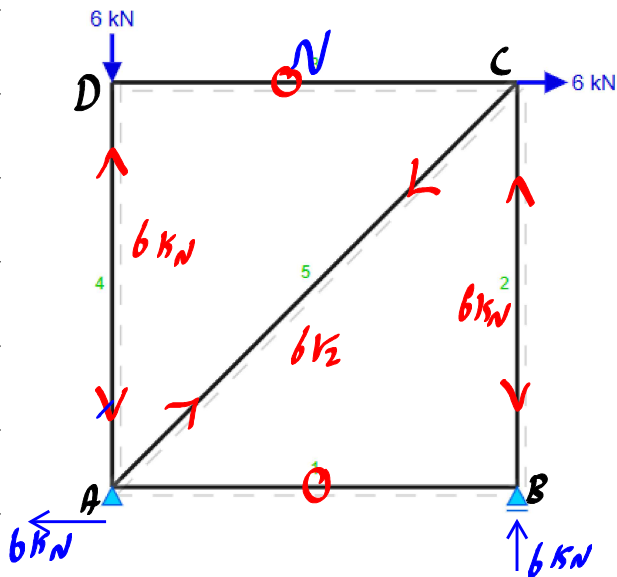
Question : (3.0 Mark)

Determine the horizontal displacement of joint D. AE is constant. Use the principle of virtual work.



real forces

virtual forces



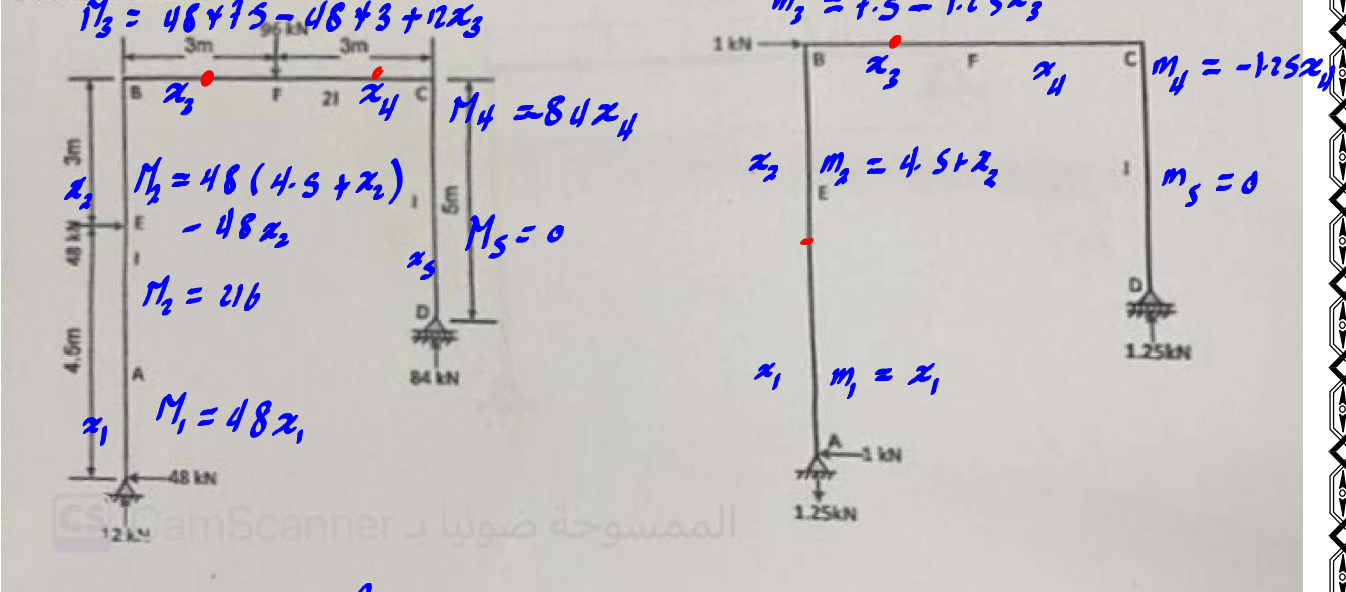
members	η (kN)	N (kN)	l (m)	$\eta N l$ (kN ² .m)
AB	0	0	3	0
BC	-1	-6	3	18
CD	-1	0	3	0
DA	0	-6	3	0
AC	$\frac{1}{\sqrt{2}}$	6 $\sqrt{2}$	3 $\sqrt{2}$	36 $\sqrt{2}$
$\sum \eta N l$				68.91 kN ² .m

$$1 \text{ kN} \cdot \Delta = \frac{\sum \eta N l}{AE}$$

$$1 \text{ kN} \cdot \Delta = \frac{68.91}{AE}$$

Question two: (4.0 Mark)

Determine the horizontal displacement at joint B of the frame shown below. Take $E = 200 \text{ GPa}$, $I = 500 \times 10^6 \text{ mm}^4$



$$1 \text{ kN} \Delta = \int_0^L \frac{Mm}{EI} dx$$

$$1 \text{ kN} \Delta = \int_0^{4.5} \frac{48x_1^2}{EI} dx + \int_0^3 \frac{216(4.5+x_2)}{EI} dx + \int_0^3 \frac{(216+12x_3)(7.5-1.25x_3)}{2EI} dx$$

$$\int_0^3 \frac{(-84x_4)(-1.25x_4)}{2EI} dx$$

$$1 \text{ kN} \cdot \Delta = \frac{1458}{EI} + \frac{3888}{EI} + \frac{3915}{2EI} + \frac{945}{2EI}$$

$$= \frac{1}{EI} (7776)$$

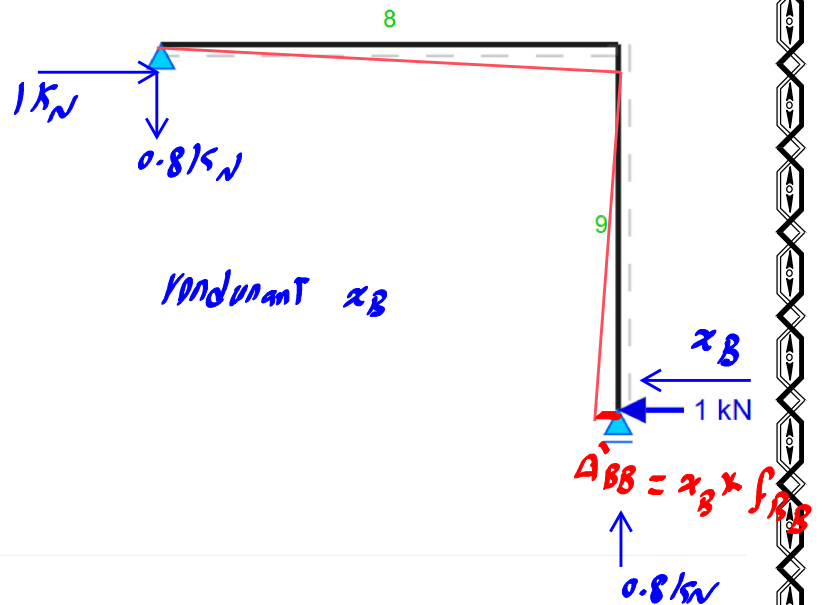
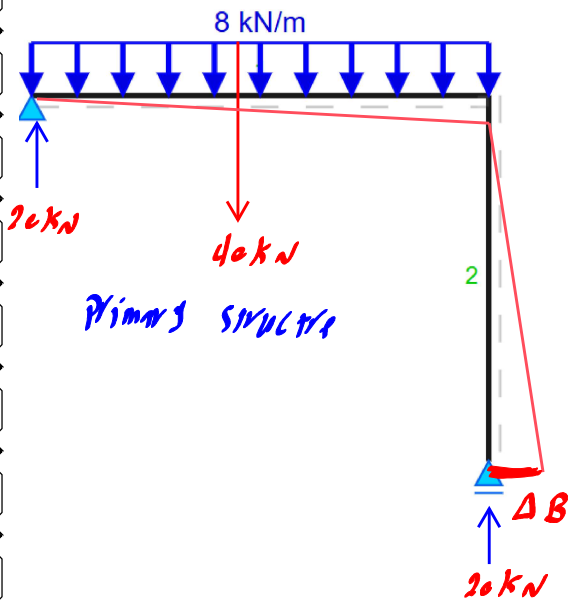
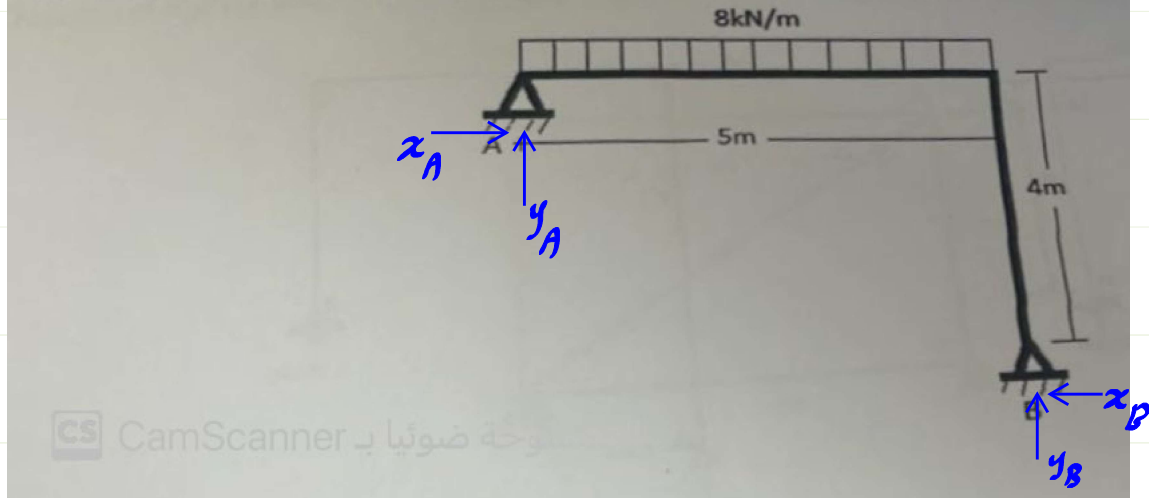
$$\Delta = \frac{7776 \times 10^6 \text{ N}^2 \text{ m}^3}{200 \times 10^9 \text{ Pa} \times (500 \times 10^6 \times 10^{-12}) \times 10^3} = 77.76 \times 10^{-3} \text{ m} = 77.76 \text{ mm}$$

$$= 7.776 \text{ cm}$$

P9 = 3, un = 4

Question Three : (4.0 Mark)

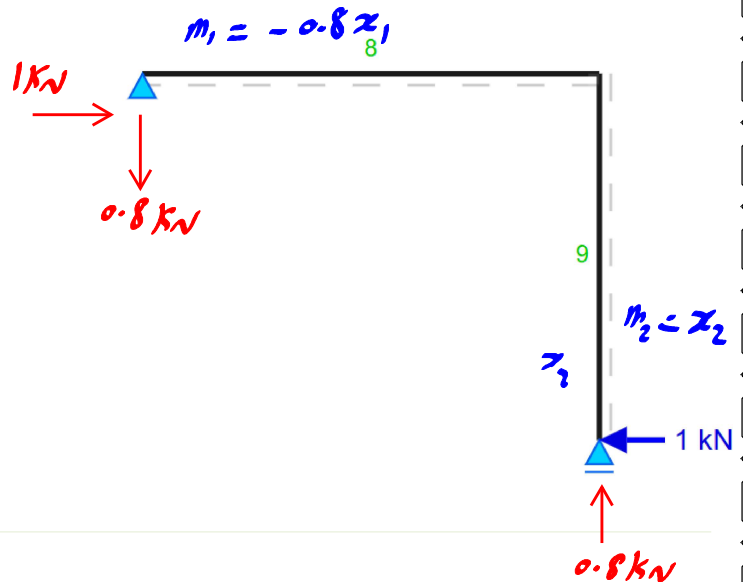
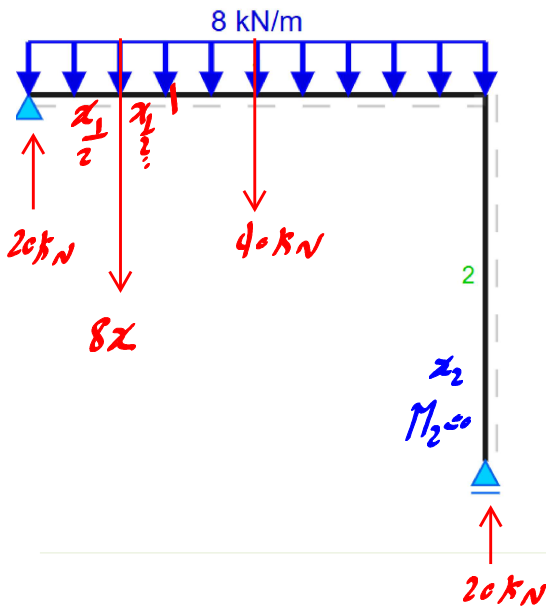
Determine the support reactions on the frame shown. EI is constant.



$$\Delta_B + \Delta'_{BB} = 0 \Rightarrow \Delta_B + x_B \int_{BB} = 0$$

$$\Delta_B = \int_0^L \frac{Mm}{EI} dx$$

$$M_1 = 20x_1 - 4x_1^2$$

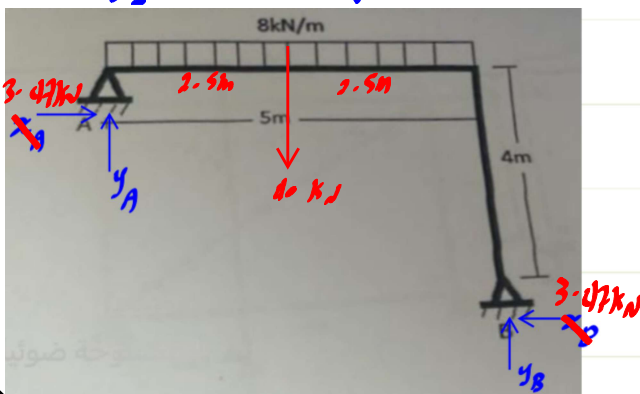


$$\Delta_{BB} = \frac{1}{EI} \int_0^L Mm dx = \frac{1}{EI} \int_0^5 (20x_1 - 4x_1^2)(-0.8x_1) dx + 0$$

$$\Delta_{BB} = \frac{-500}{3EI}$$

$$\therefore \int_{BB} = \frac{1}{EI} \int_0^5 (-0.8x_1)^2 dx + \int_0^4 x_2^2 = \frac{48}{EI}$$

$$-\frac{500}{3EI} + x_B \frac{48}{EI} = 0 \Rightarrow x_B = 3.47 \text{ kN}$$



$$\sum \mathcal{M}_A = 40 \times 2.5 + 3.47 \times 4 - y_B \times 5 = 0$$

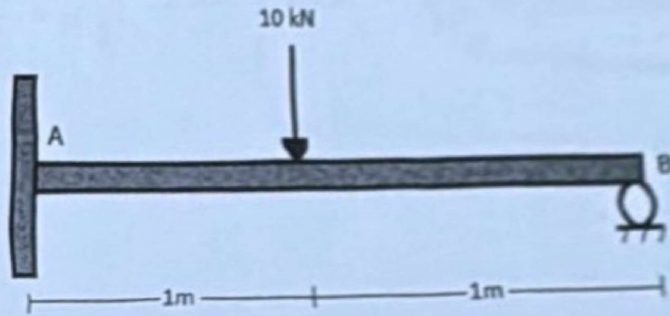
$$y_B = 22.8 \text{ kN}$$

$$\sum \mathcal{F}_y = y_A - 40 + 22.8 = 0$$

$$y_A = 17.2 \text{ kN}$$

Question four: (4.0 Mark)

Draw S.F.D and B.M.D. EI is constant



CS CamScanner الممسوحة ضوئياً بـ