سلسله العبدين الحسنين

M.T قبل

t_1

رقم
(11)

ملزم ٢٥

استراتجيه ٢ مدني

Str(2)
٢ مدني

Super Position مراجعه
Part (I)

الحاديه عشر
2010

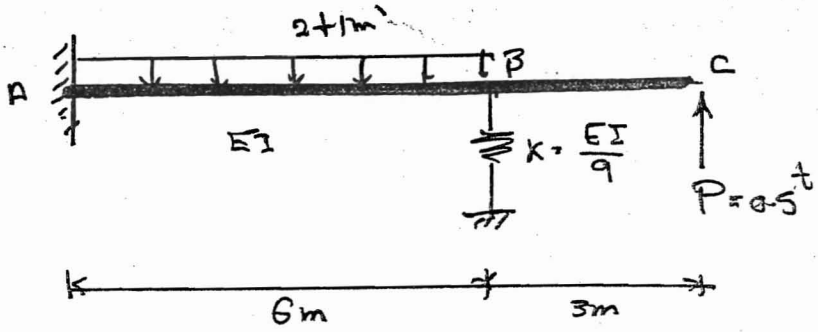
Example	Year	Page
(1)	Jun (1995)	(1,2)
(2)	Jun (1996	(3,4)
(3)	Nov (1997)	(4→6)
(4)	Nov (1998)	(6, 7)
(5)	Nov (1999)	(8, 9)
(6)	Jane (2001, 2005)	(9, 10)
(7)	Jun (2002)	(11, 12)
(8)	Nov (2003)	(12→14)
(9)	Nov (2005)	(15, 16)

Exam Jan (1995)

p) ارسم (B.M.D & S.F.D) ثم

c) احسب الازاحة عند نقطة

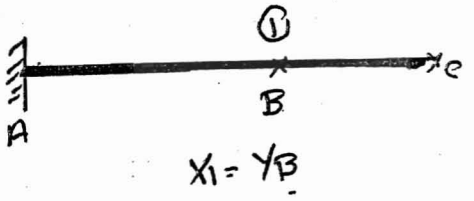
b) احسب قيمة (P) بحيث يكون الازاحة عند (c) = صفر.



---

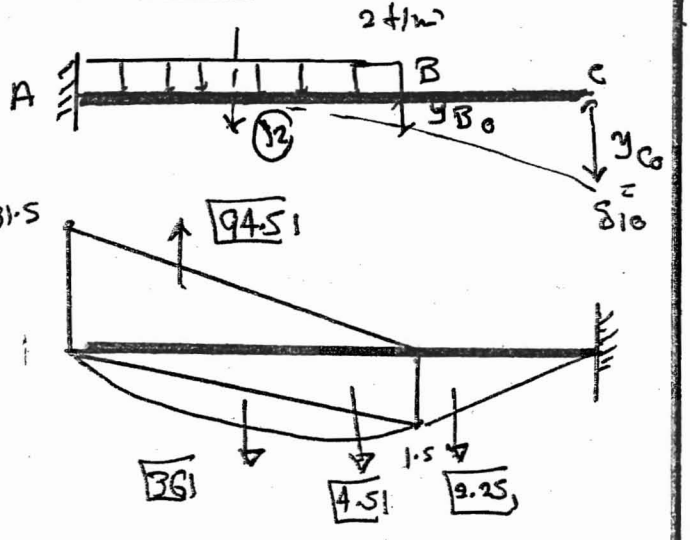
(1) Degree $D = 3 - 2 = 1$

(2) M.S'

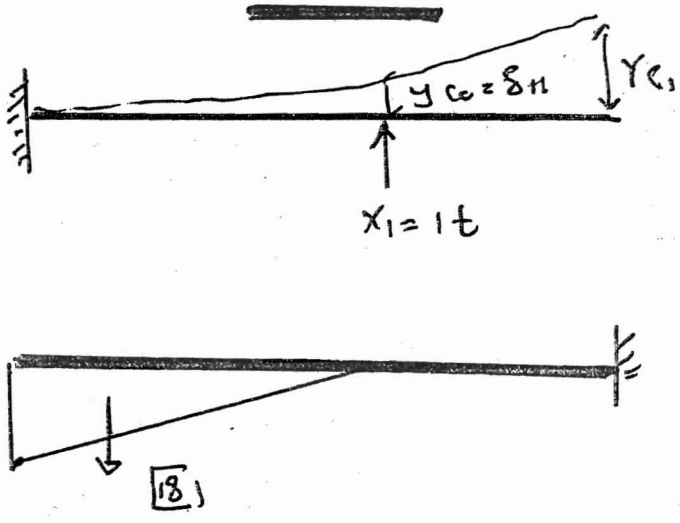


$X_1 = Y_B$

(3) Load (0)



(4) Load (1)



$$* \delta_{10} = y_{B_0} = \frac{261}{EI} \text{ m}$$

$$* \delta_{11} = y_{B_1} = \frac{-72}{EI} \text{ m}$$

$$* Y_{C_0} = \frac{418.5}{EI} \text{ m}$$ تحسب للطلبة الثاني

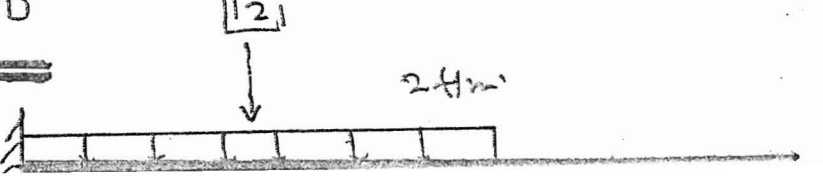
$$* Y_{C_1} = \frac{-126}{EI} \text{ m}$$ تحسب للطلبة الثاني

(5) Condition at (B) $\delta_{10} + \delta_{11} X_1 = \frac{X_1}{K}$

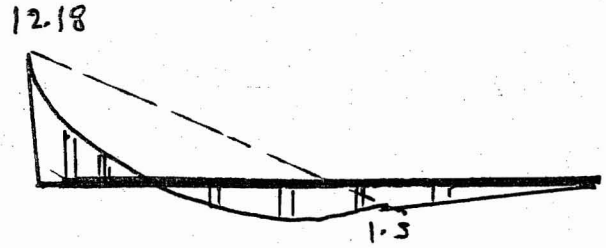
$$\therefore \frac{261}{EI} + \frac{-72}{EI}(X_1) = \frac{X_1 \times 9}{EI}$$

$$\therefore X_1 = Y_B = 3.22 t$$

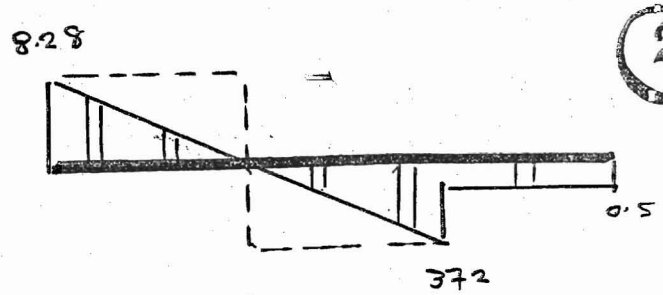
(6) Final S.F.D, B.M.D



Reactions 12.18 (



(B.M.D)



(S.F.D)

(*) الهبوط عند (C) $y_c = y_{c0} + x_1 y_{c1}$ $\therefore y_c = \frac{418.5}{EI} + 3.32 \times \frac{-126}{EI}$

$$\therefore y_c = 12503/EI \text{ m}$$

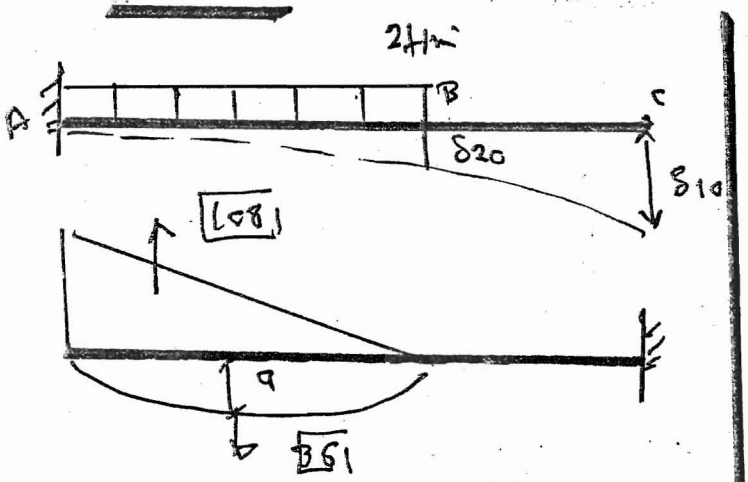
(*) لايجاد قيمة (P) التي تجعل الهبوط عند (C) = صفر مسألة جديدة

(1) Degree $D = 2$ < Y_c ملزم, Y_B

(2) M.S

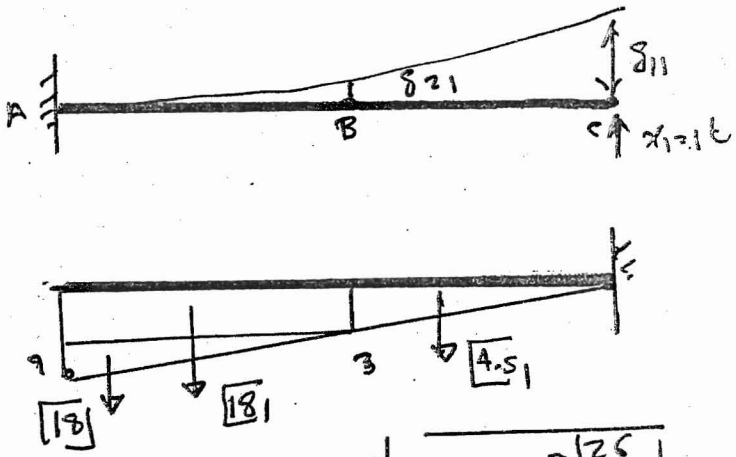
$X_2 = Y_B$ $x_1 = Y_c = P$

(3) Load (0)



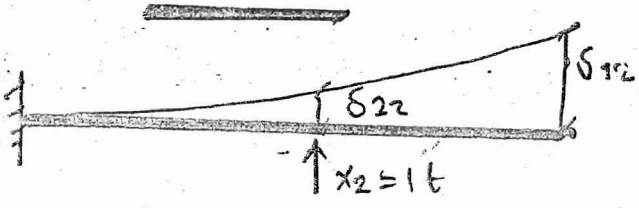
$$\delta_{10} = \frac{540}{EI} \qquad \delta_{20} = \frac{324}{EI}$$

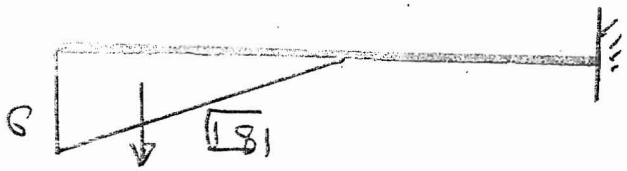
(4) Load (1)



$$\delta_{11} = -\frac{243}{EI} \qquad \delta_{21} = \frac{-126}{EI}$$

(5) Load (2)





(6) Condition

عند تقطع (C)

$$\delta_{10} + \delta_{11} x_1 + \delta_{12} x_2 = 0.0 \rightarrow (1)$$

$$\delta_{20} + \delta_{21} x_1 + \delta_{22} x_2 = \frac{x_2}{K} \rightarrow (2)$$

بحل المعادلتين (1) (2) نحصل على

$x_1 = P = 0.765$ t $\quad x_2 = 2.8$ t $= Y_B$

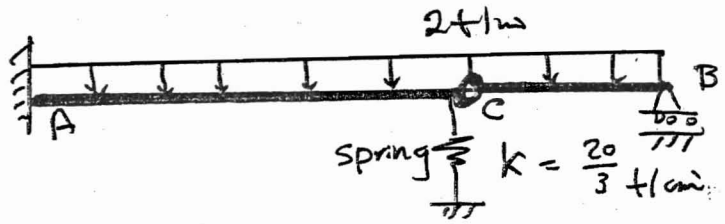
Ex(2) Jan (1996)

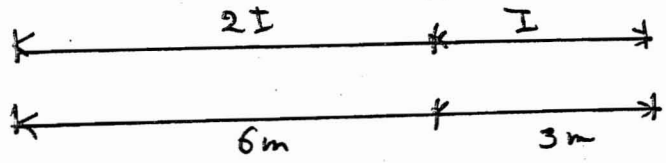
* باستخدام طريقة التجميع احسب (Yc) وارسم (B.M.D) & (S.F.D)

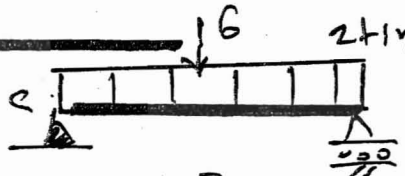
* $EI = 6000\ t.m^2$

* $K = \frac{20}{3}\ t/cm$

$= \frac{20}{3} \times 100\ t/m$







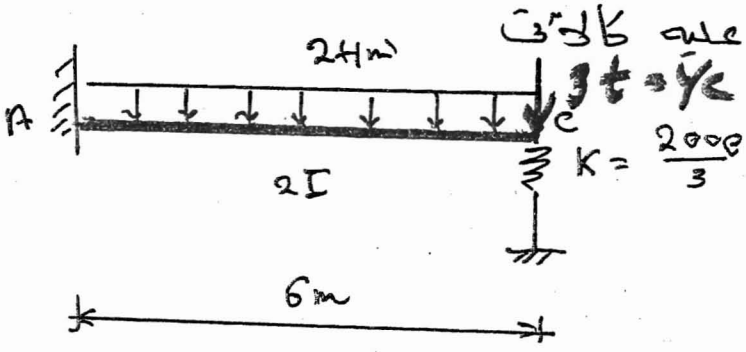
* بالفصل عند نقطة (C) يصبح الجزء (BC) محدد

* يتم حل المسأله الغير محدده بعد عكس رد الفعل

$Y_c = 3t$

(Ac) لعكس عكس

(Yc) على كالوتى



المسأله الاصليه

(1) Degree

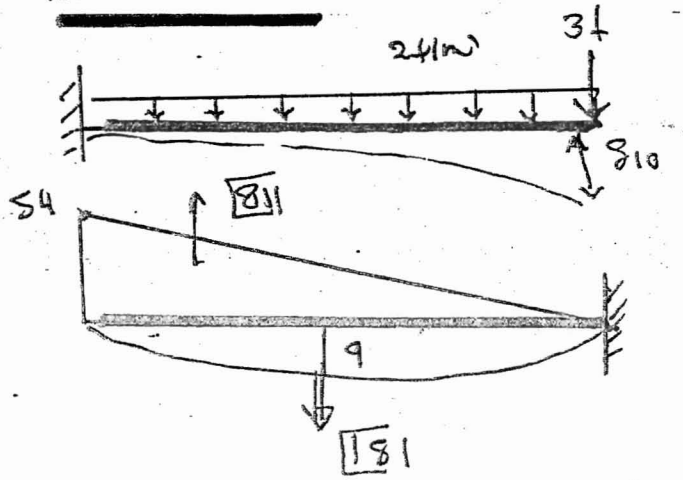
D = 1

(2) M. S'

حذف رد فعل (C) لأنه تم عكسه

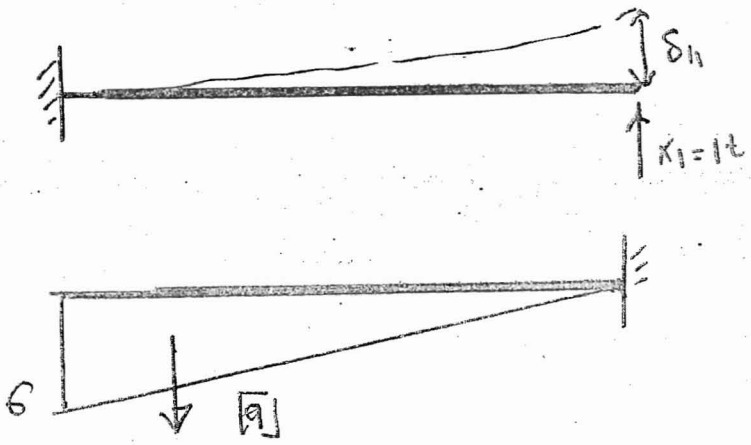
$X_1 = Y_c$

(3) Load (0)



$$* \delta_{10} = \frac{270}{EI}\ m$$

(4) Load (1)

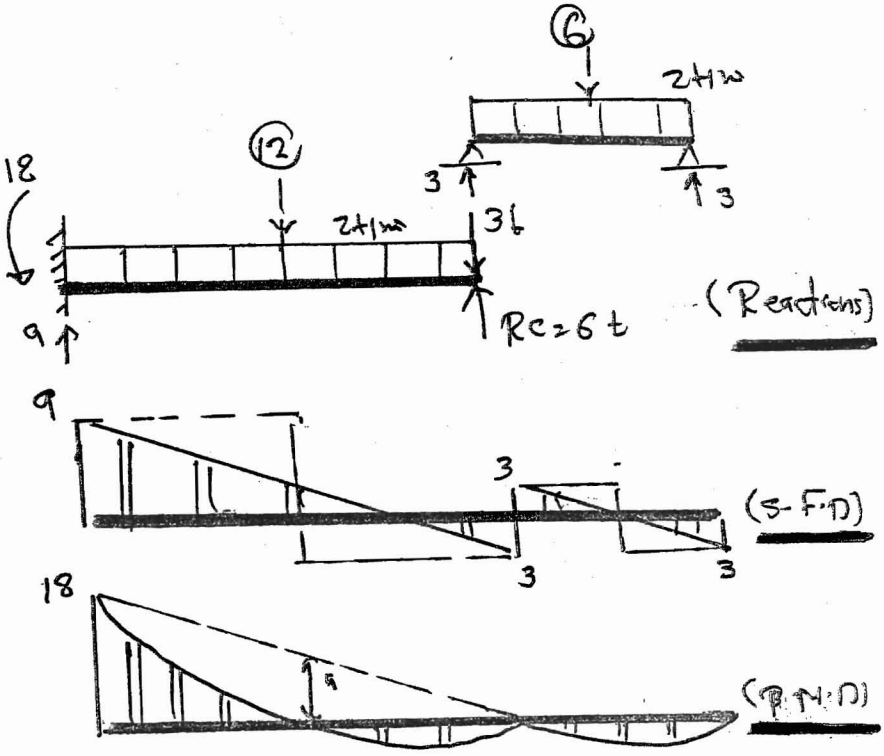


$$* \delta_{11} = \frac{-36}{EI}\ m$$

(5) Condition at (C) $\delta_{10} + \delta_{11} x_1 = y_c = \frac{x_1}{K} \sim \frac{2000}{3}$ t/m

$\therefore \frac{270}{6000} - \frac{36}{6000} x_1 = \frac{3x_1}{2000}$ $\therefore 15x_1 = 90$ $\therefore x_1 = Y_c = 6\,t$

(6) Final S.F.D, B.M.D



* لحساب (y_c) يساوى مقدار الانضغاط فى الزنبرك

$y_c = \frac{x_1}{K}$

$\therefore y_c = \frac{6}{2000/3}$

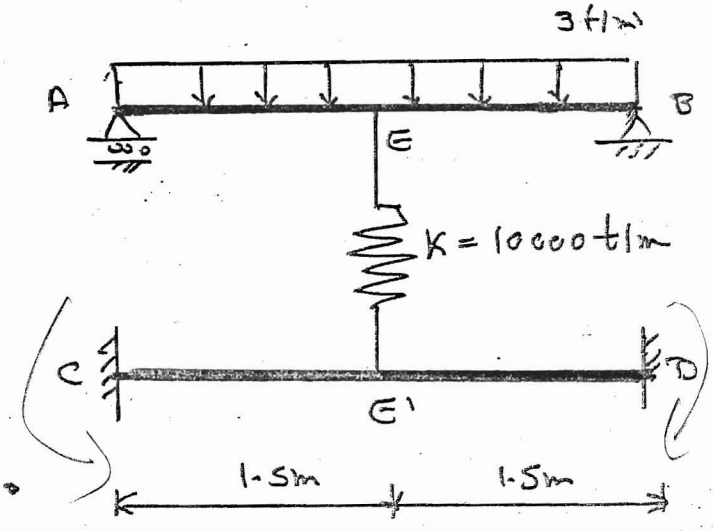
$\therefore y_c = \frac{18}{2000}$ m

M.T 2007 جامده

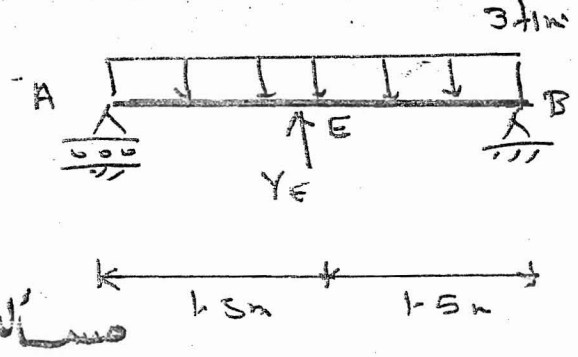
Ex(3) Nov(1997)

* باستخدام طريقة التصحيح ارسم كلا من (AB) & (CD) الـ (S.F.D) & (B.M.D)

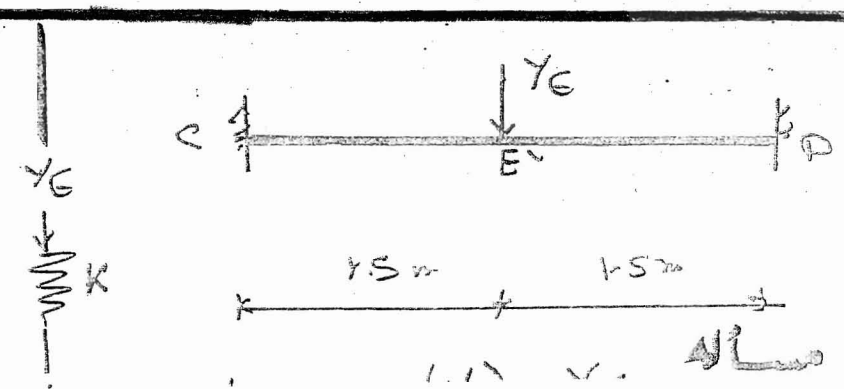
* معلوم فيه $EI = 10000\,t/m^2$



• تغيير كمرات متصله غير زنبرك



مسأله

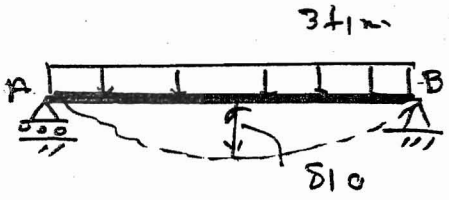


مسأله

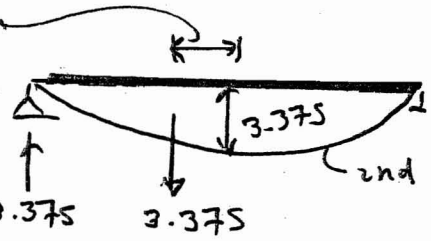
مسأله (1) Beam (AB)

• D = 1 • $X_1 = Y_C$

• Load (0)

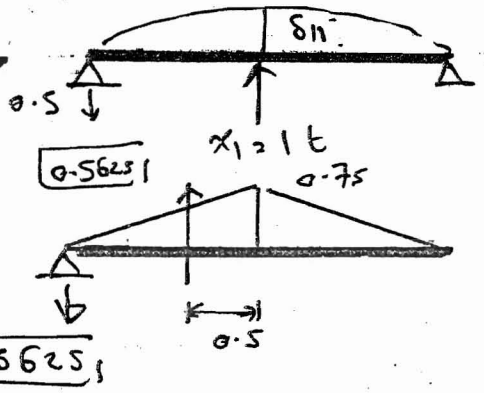


$\frac{3}{8}(4) = 0.5625$



$$\therefore \delta_{10} = 3.164 / EI$$

• Load (1)



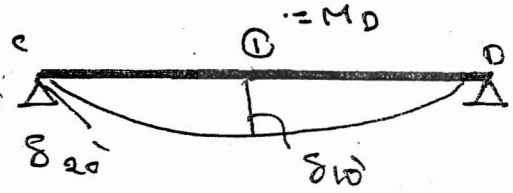
$$\therefore \delta_{11} = \frac{-0.5625}{EI}$$

مسأله (2) Beam (CD)

• D = 2 • $X_1 = Y_C$ • M.S

• $X_2 = M_C = M_D$

• Load (0)

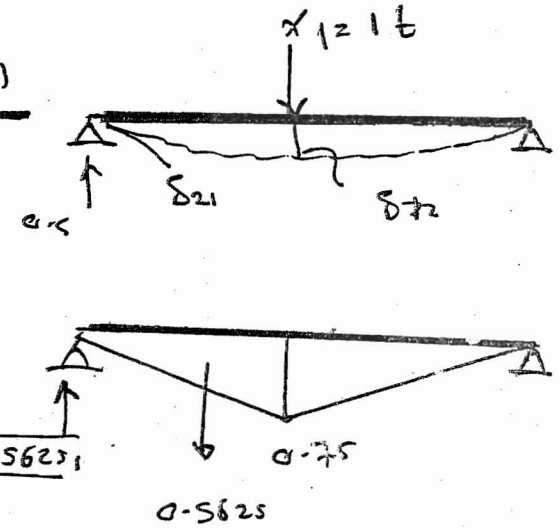


تحديد المعاملات

$$\therefore \delta_{20} = \frac{0}{EI} = 0.0$$

$$\therefore \delta_{10} = \frac{0}{E} = 0.0$$

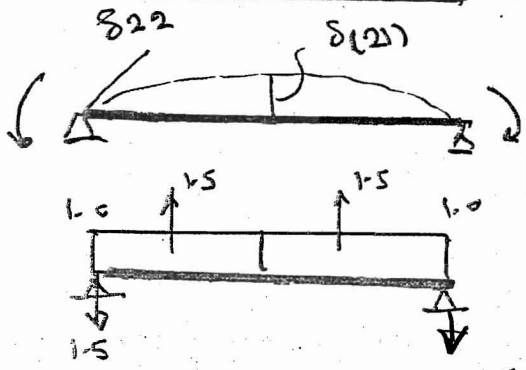
• Load (1)



$$\therefore \delta_{11} = 0.5625 / EI$$

$$\therefore \delta_{12} = 0.5625 / EI$$

• Load (2)



$$\therefore \delta_{21} = \frac{-1.125}{EI}$$

$$\therefore \delta_{22} = -1.5 / EI$$

(CD) للعمود

(*) Condition at (C) $\delta_{20} + X_1 \delta_{21} + X_2 \delta_{22} = 0.0$ عند الرطانة

بالتعويض $0.0 + \frac{0.5625}{EI} X_1 + \frac{-1.5}{EI} X_2 = 0.0$ ← (1)

$\therefore X_1 = 2.67 X_2$

at (E) $\delta_{10} + \delta_{11} X_1 = (\delta_{10} + X_1 \delta_{11} + X_2 \delta_{12}) + \frac{X_1}{K}$ ← عند نقطة (E)

$$\frac{3.164}{10000} - \frac{0.5625}{10000} X_1 = 0 + \frac{0.5625}{10000} X_1 - \frac{1.125}{10000} X_2 + \frac{X_1}{10000} \quad \rightarrow (3)$$

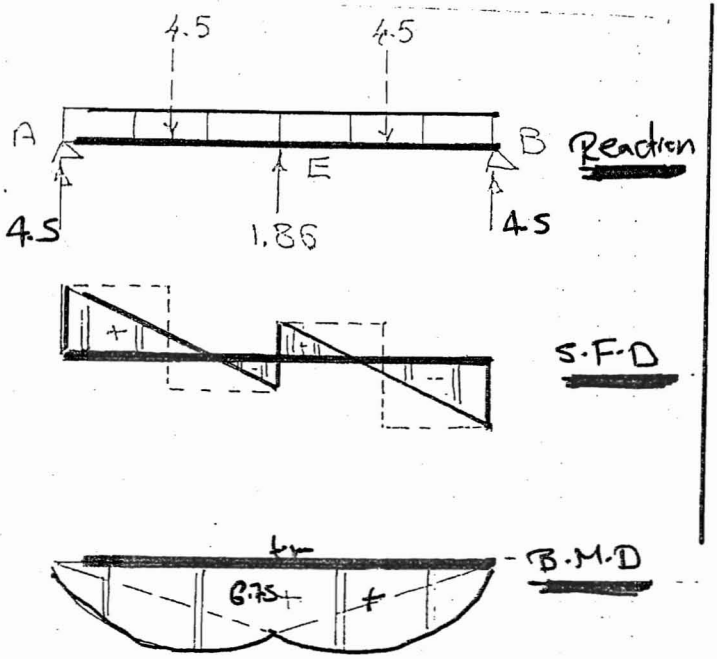
بحل (1) و (2) نحصل على

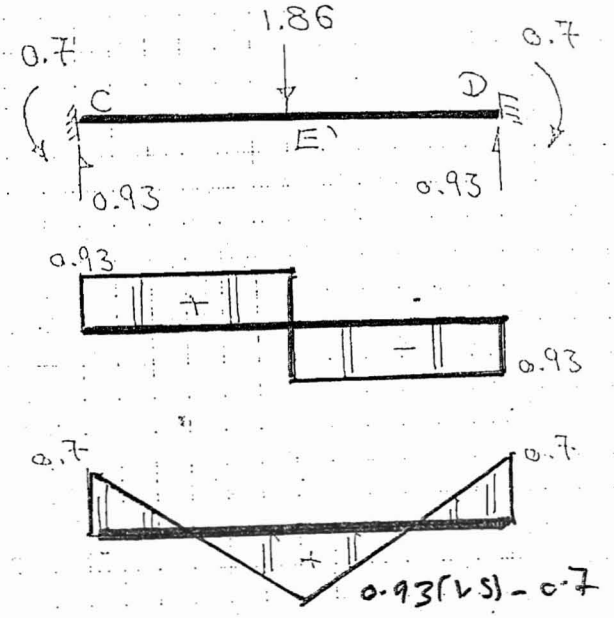
$\therefore X_1 = Y_G = 1.86$ t

$\therefore X_2 = M_C = M_D = 0.7$ t.m

ترسم كل كمرة على حده

(Final S.F.D, B.M.D)

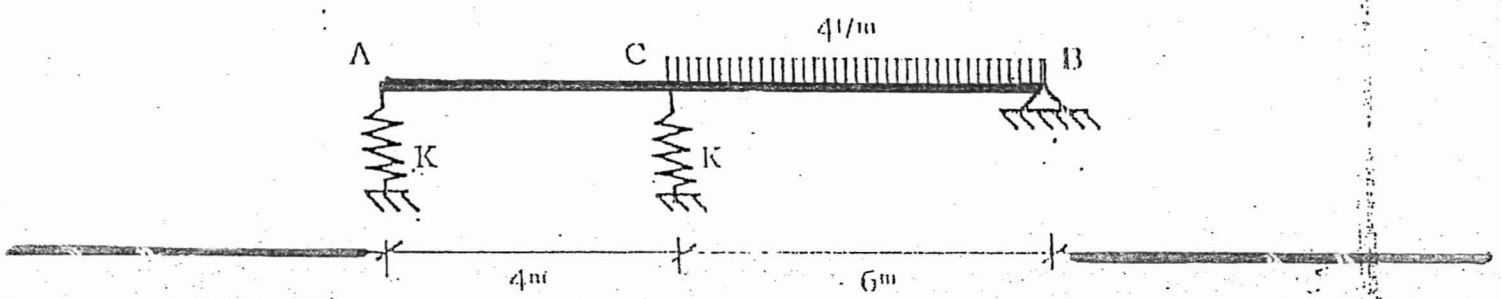




Ex(4) Nov(1998)

لكمرة المبينة بشكل (١) ارسم أشكال قوى القص وعزم الانحناء نتيجة للأحمال المبينة علما بأن :

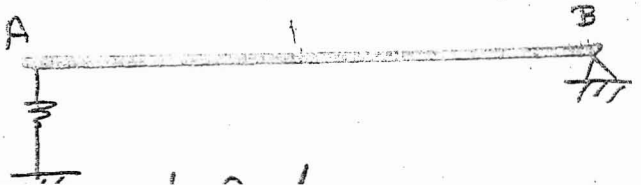
For the *Beam* A B, EI = 10000 t/m²
For the *springs* at A & C, K = 10 t/cm



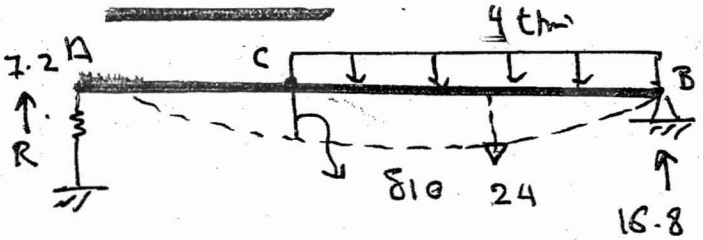
(1) Degree of D = 3 - 2 = 1

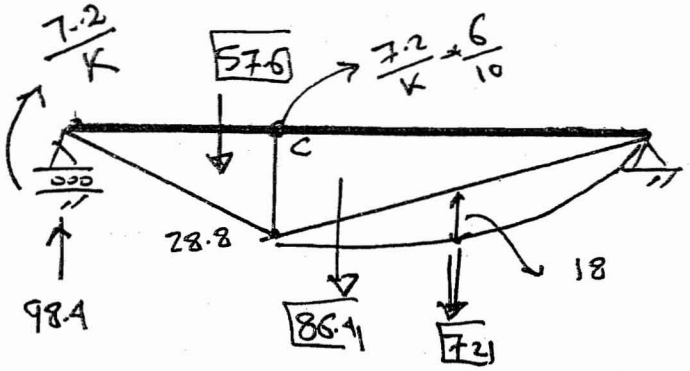
(2) M.S. $X_1 = Y_C$ إلغاء الزوجود الزائد (٢)

لاحظ أن القوه المراقبه للجزء هة (A) الزائده الزائده يكون



(3) Load (c)



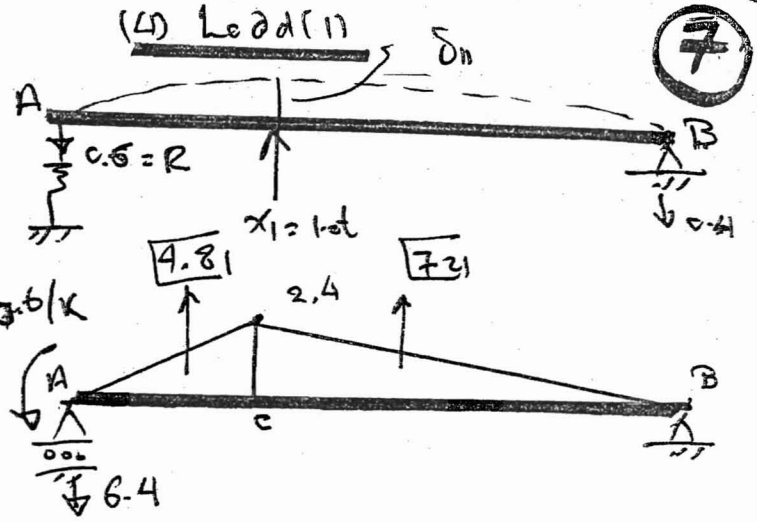


$$\delta_{10} = \frac{98.4\,(4) - 57.6\,(\frac{4}{3})}{EI}$$

Spring اضافة الـ $+ \frac{7.2}{K}\left(\frac{6}{10}\right)$ ← ستنتج ما يكون عند (c)

$$\therefore \boxed{\delta_{10} = \frac{360}{EI}\ m}$$

(4) Load (1)



ستنتج من (Y1)

$$\frac{0.6}{K} = \frac{0.6}{K} \times \frac{6}{10}$$

$$\delta_{11} = \frac{-0.6(6)}{10K} + \frac{-6.4(4) + 4.8(\frac{4}{3})}{EI}$$

ستنتج ما يكون عند (c)

$$\therefore \boxed{\delta_{11} = \frac{-22.8}{EI}\ m}$$

(5) Condition

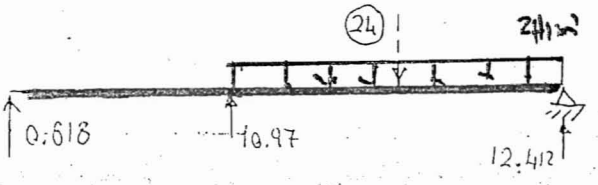
$$\delta_{10} + X_1 \delta_{11} = \frac{X_1}{K} \quad \therefore \frac{360}{EI} - \frac{22.8}{EI} X_1 = \frac{X_1 \times 10}{EI}$$

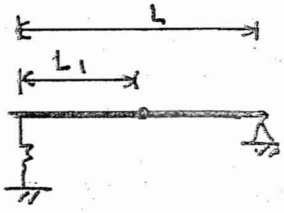
$$\therefore X_1 = 10.796 \qquad \therefore \boxed{Y_C = 10.97\ t}$$

(6) Final S.F.D, B.M.D

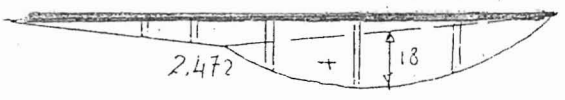
عند وجود Spring في (B.M.D) يكون هناك هبوط إضافي حادث عند النقطة بالإضافة لهبوط الأحمال = نسبة $\frac{R}{K}$ × لذلك النقطة

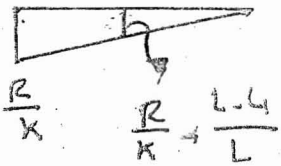
Reaction



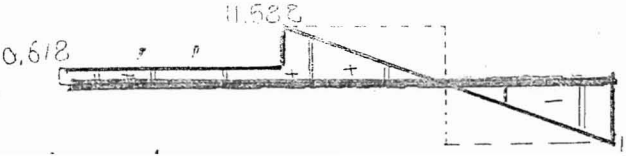


B.M.D





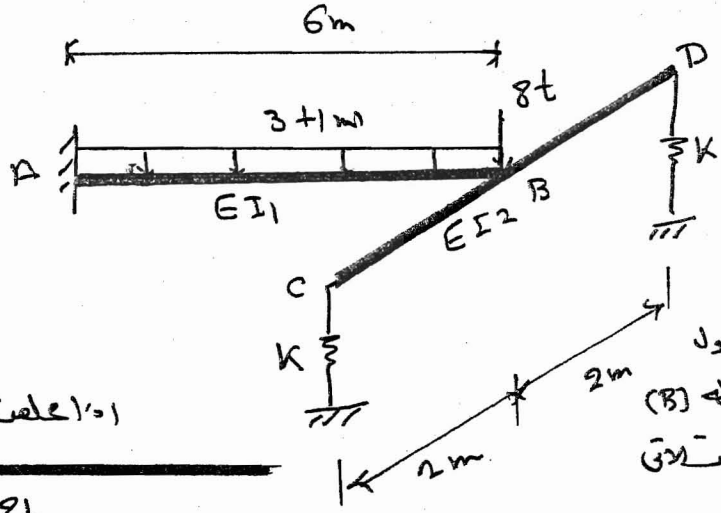
S.F.D



Ex(5) NOU (1994)

* (S.F.D) & (B.M.D) المطلوب رسم

(CD & AB) لكل من العضوين

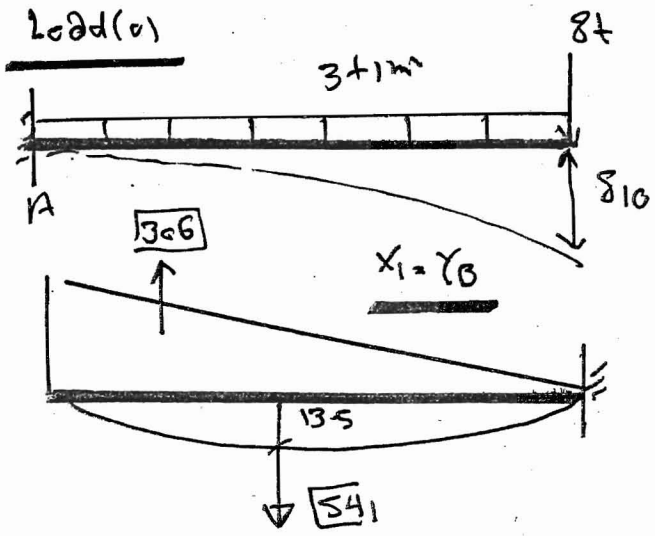


- $EI_1 = 19800\ t\cdot m^2$
- $EI_2 = 10000\ t\cdot m^2$

* كل عزم يعامجهول عند نقطه (B) نقطه التلاقي

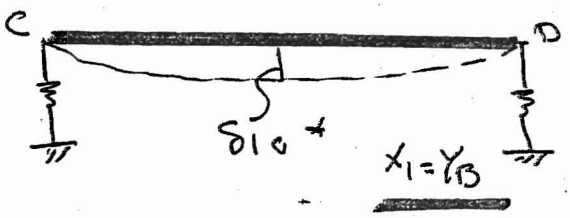
* لاحظت أنه هناك هبوط عند (B) = اسم.

Load(0)



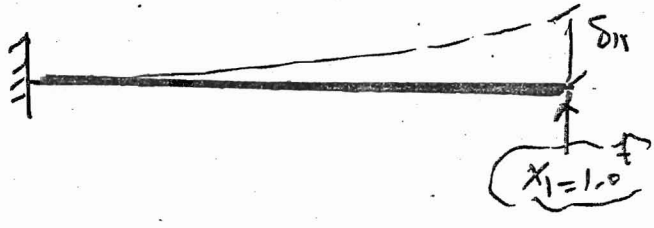
$$\therefore \delta_{10} = \frac{1062}{EI_1}$$

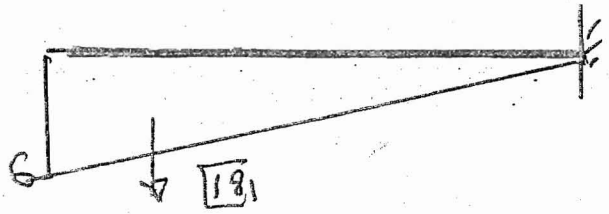
Load(0)



$$\therefore \delta_{10}^{*} = 0.0$$ لا يوجد احمال

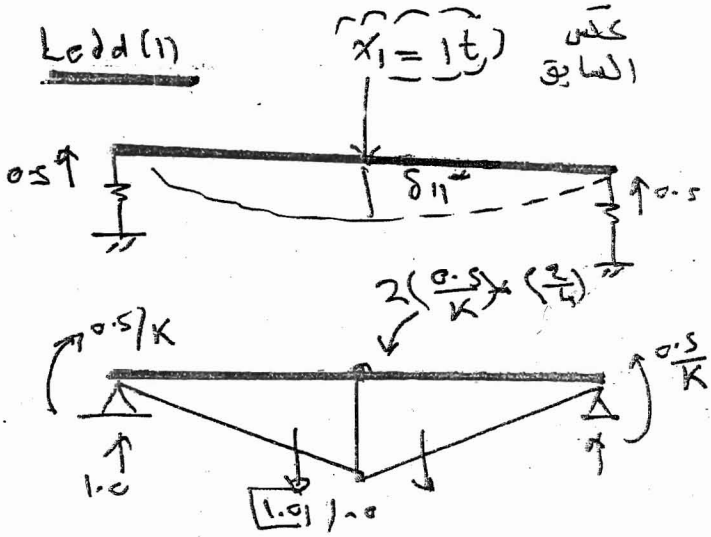
Load(1)

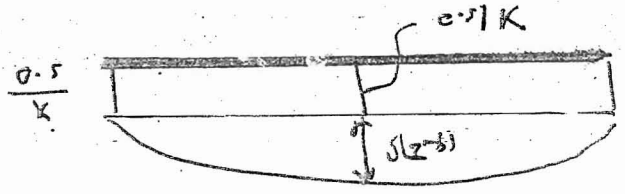




$$\therefore \delta_{11} = \frac{72}{EI}$$

Load(1) عكس السابق $X_1 = 1\ t$





$$\therefore \delta_{11}^{*} = \left[\frac{0.5}{K} + \frac{4/3}{EI_2}\right]$$

(Condition)

$$\delta_{10} + x_1 \delta_{11} = y_B$$

$$\frac{1062}{EI_1} - \frac{72}{EI_1} x_1 = 0.01$$

$EI_1 = 19800$

$$\therefore x_1 = Y_B = 12\ t$$

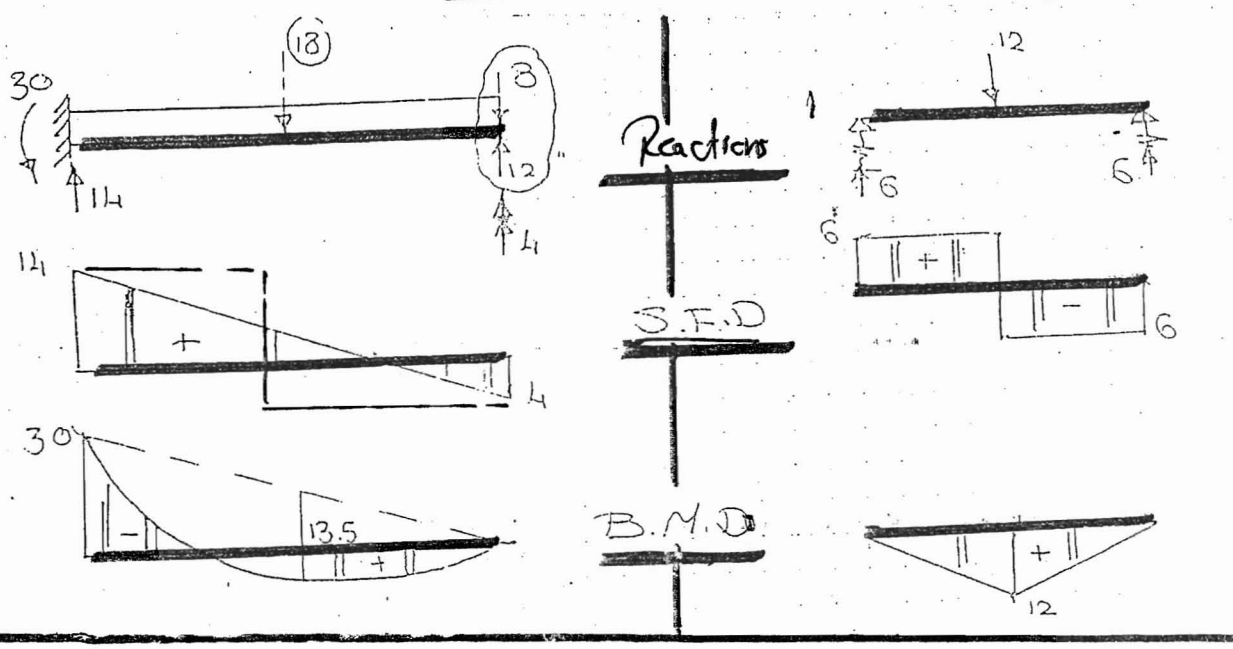
لحساب (K) حساده الزنبرك

$$\delta_{10}^* + x_1 \delta_{11}^* = y_B = 0.01$$

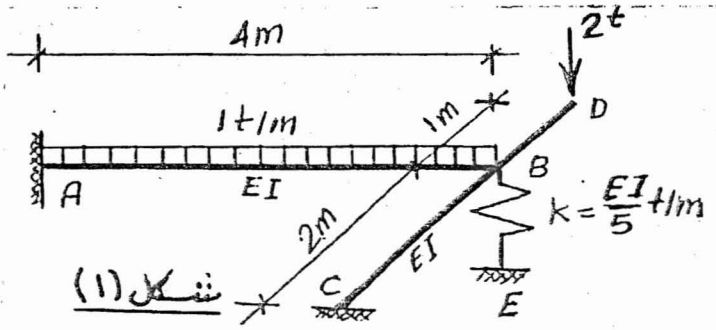
$$0 + \left(\frac{0.5}{K} + \frac{4/3}{10000}\right) = 0.01$$

$$\therefore K = 714.28\ t/m$$

Final B.M.D, S.F.D



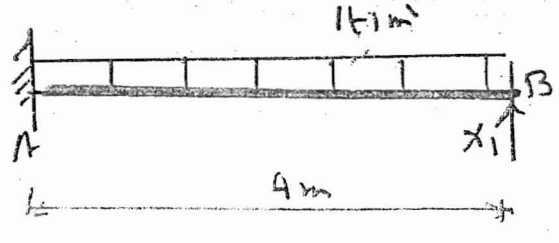
EX(6) Jan (2001)

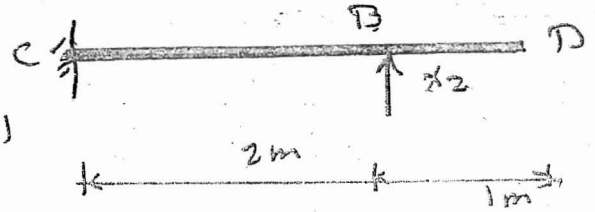


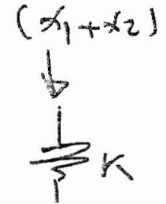
شكل (١)

أجب عن خمسة أسئلة فقط من الأسئلة الآتية

١- الكمرتان "AB" و "CBD" المبينتان بشكل (١) لهما نفس القطاع وترتكزان ارتكازاً بسيطاً على ركيزة مرنة عند "B" ارسم شكل عزم الانحناء للكمرتين نتيجة الأحمال المؤثرة وإذا علم أن $EI = 5000\ t.m^2$ إحسب مقدار الترخيم عند "B".



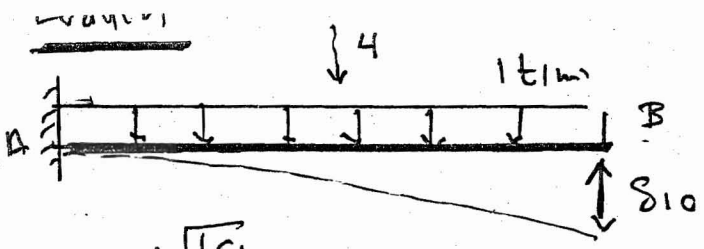


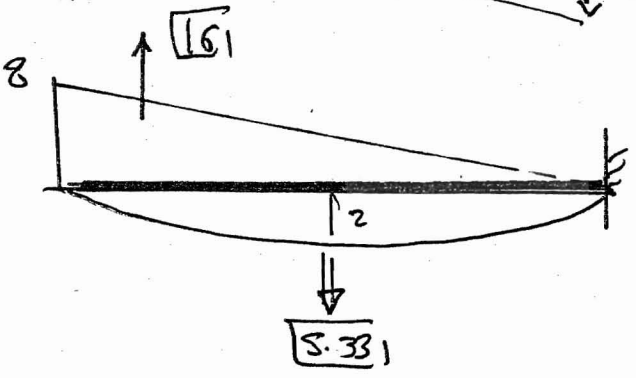


Beam (AB)

Beam (CBD)

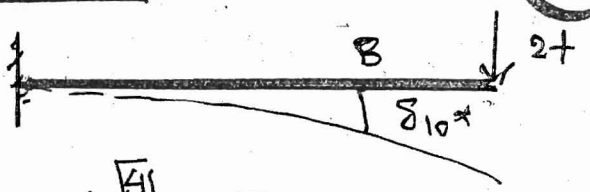
Load (0)

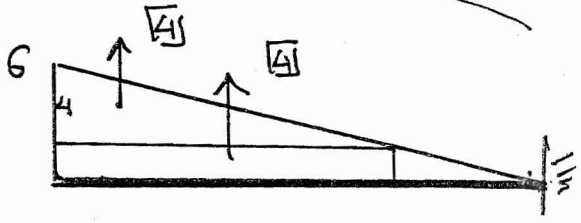




$$\therefore \delta_{10} = \frac{32}{EI}$$

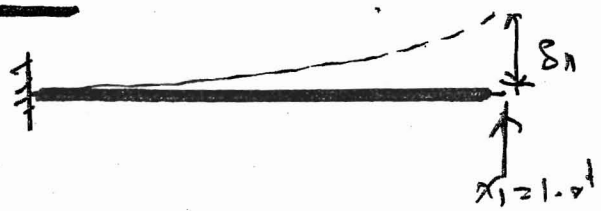
Load (0)

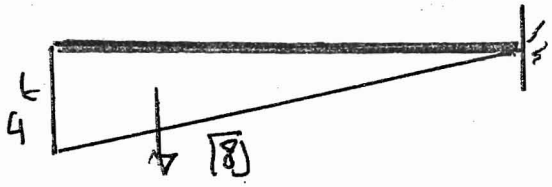




$$\delta_{10}^* = \frac{9.33}{EI}$$

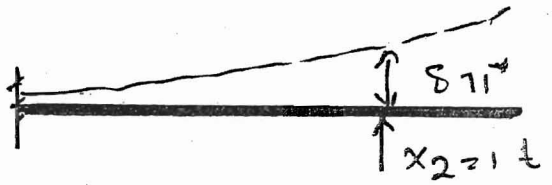
Load (1)

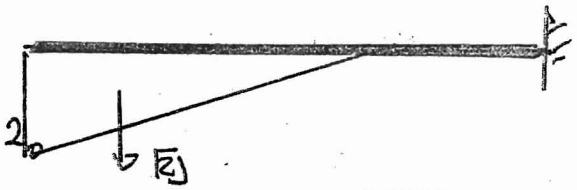




$$\therefore \delta_{11} = \frac{-21.33}{EI}$$

Load (1)





$$\delta_{11}^* = \frac{-2.67}{EI}$$

Condition

$$\therefore \delta_{10} + X_1 \delta_{11} = \frac{X_1 + X_2}{K}$$

$$\frac{32}{EI} - \frac{21.33}{EI} X_1 = \frac{X_1 + X_2}{EI/5}$$

$$21.33 X_1 - 2.67 X_2 = 22.67 \longrightarrow (1)$$

Condition

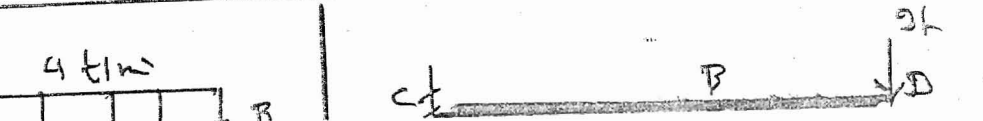
$$+ \delta_{10}^* + X_1 \delta_{11}^* = \frac{X_1 + X_2}{K}$$

$$\frac{9.33}{EI} - \frac{2.67}{EI} X_2 = \frac{X_1 + X_2}{EI/5}$$

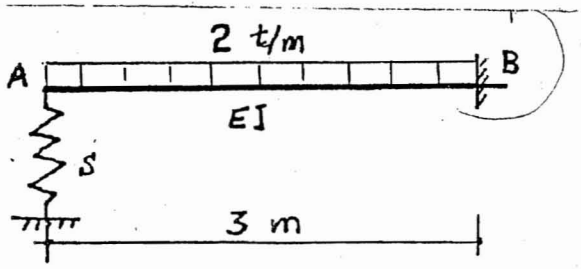
$$26.33 X_1 + 5 X_2 = 32 \longrightarrow (2)$$

* حل المعادلتين نحصل على

$$X_1 = 1.123 t \quad , \quad X_2 = 0.485 t$$



Ex(7) June (2002)



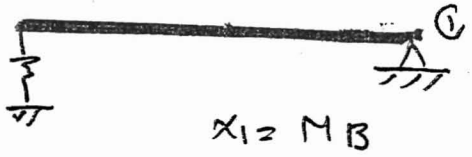
(1) حل

- للكمرة المثبتة عند B والمرتكزة ارتكازا مرنا عند A والمبينة بشكل (١) أوجد باستخدام طريقة التجميع أشكال القص وعزم الانحناء (B.M.D., S.F.D.) نتيجة للحمل المبين بالإضافة إلى دوران ضد اتجاه عقارب الساعة عند B قدره 0.001 دائري إذا علمت أن: $S=1000$ t/m, $EI=10000$ t.m²

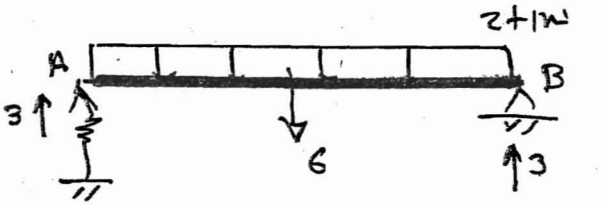
(1) Degree $D = 3-2 = 1$

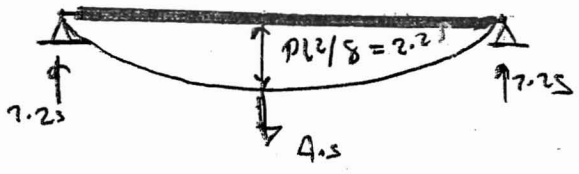
(2) M.S

* حدث دوران عند (B) لذلك شرط الاتزان هو (MB) في M.S



(3) Load (0)



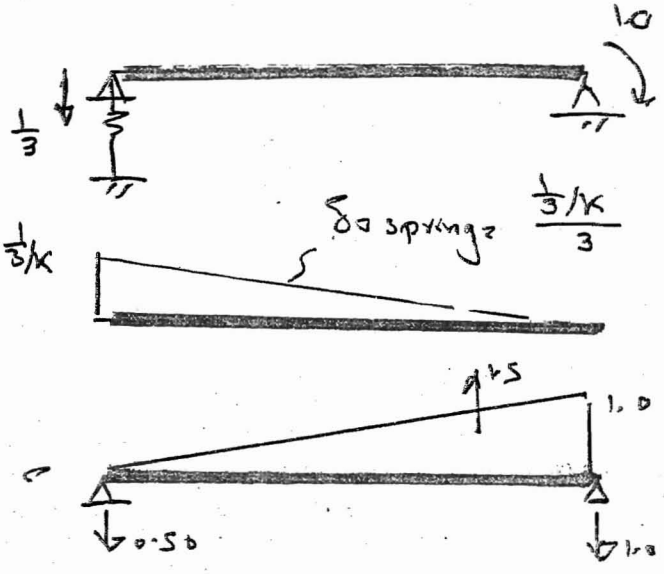


$$\delta_{10} = \frac{-2.25}{EI} - \frac{\frac{3}{K}}{L}$$

حيث تكون rotation

$$\therefore \boxed{\delta_{10} = \frac{-12.25}{EI}}$$

(4) Load (1)

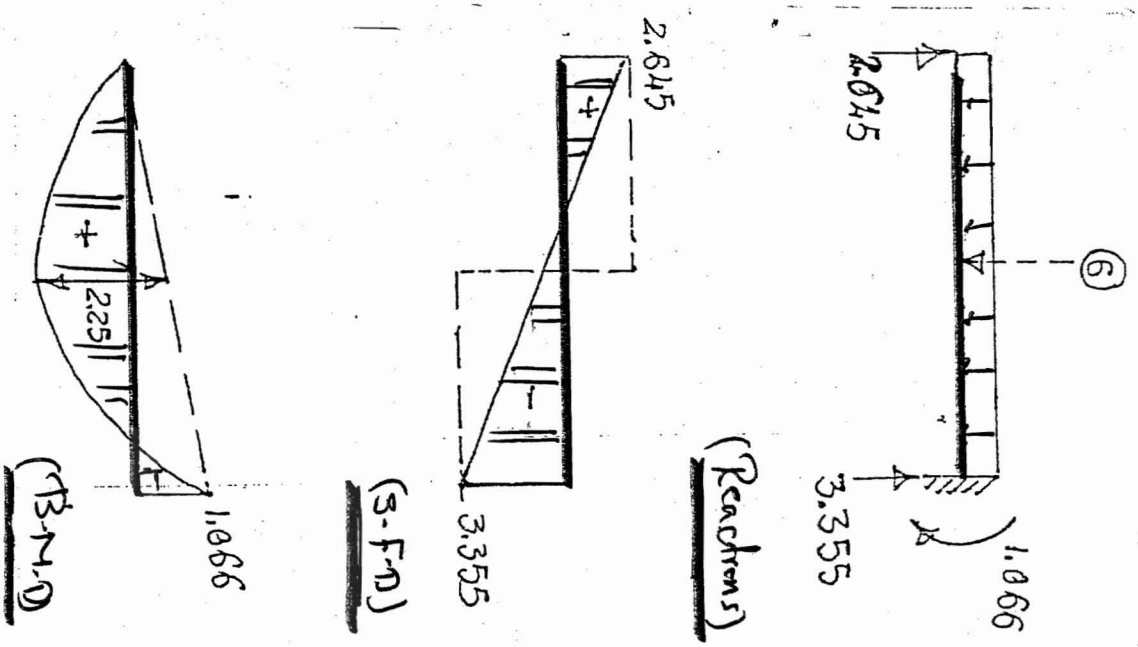


$$\boxed{\delta_{11} = \frac{\frac{1}{3}/K}{3} + \frac{1.0}{EI} = \frac{2.111}{EI}}$$

(5) Condition $\delta_{10} + X_1 \delta_{11} = \phi_B = -0.001$ rad صنكارب الساعة

$$\therefore \frac{-12.25}{EI} + \frac{2.111}{EI} X_1 = -0.001 \quad \therefore \boxed{X_1 = 1.065 \text{ t.m} = M_B}$$

(6) الانحراف عند (A) $y_A = \frac{R_A}{K} = \frac{2.645}{1000} = 0.002645$ m

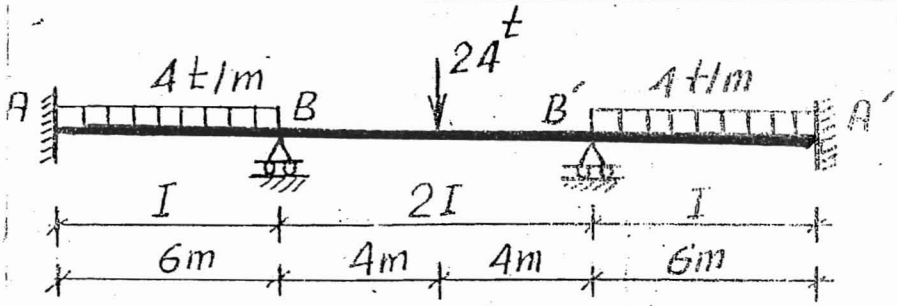


EX(8) NOV(2003)

للكمرة المتماثلة المبينة بشكل (٢)

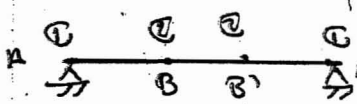
المطلوب:-

) ارسم شكل عزم الإنحناء وشكل القص للكمرة نتيجة الأحمال المبينة وذلك باستخدام طريقة التجميع.



) إذا علم أن $EI = 20000\ t.m^2$ ارسم شكل عزم الإنحناء للكمرة نتيجة هبوط متساوى قدره ٥,٠سم عند الركيزتين B', B وذلك باستخدام طريقة التجميع.

شكل (٢)



(1) Degree $6-2=4$

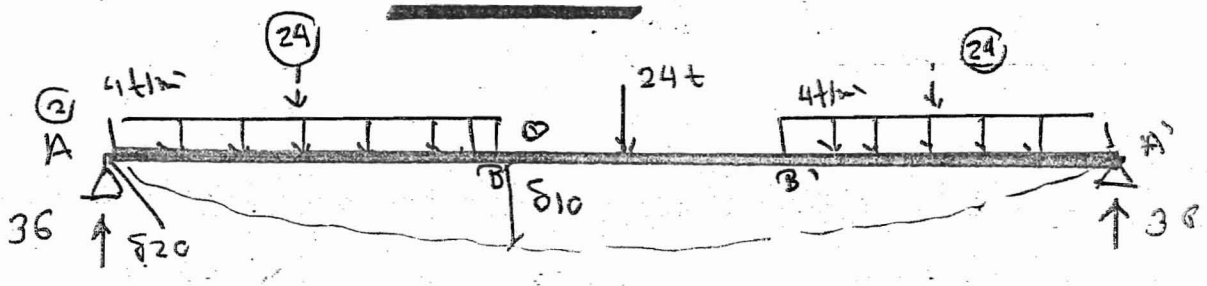
للتماثل $= \frac{4}{2} = 2$

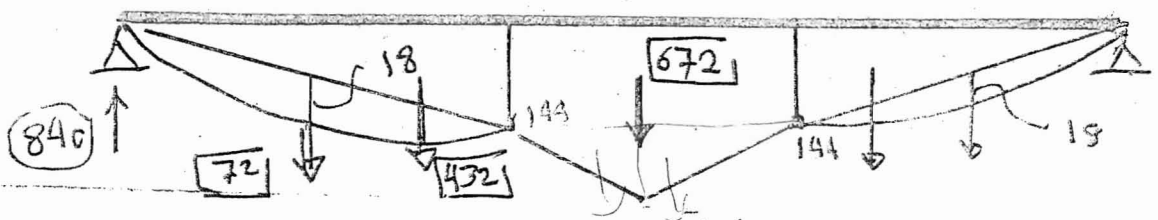
(2) M.S

$X_1 = Y_B = Y_{B'}$

$X_2 = M_B = M_{B'}$

(3) Load[0]

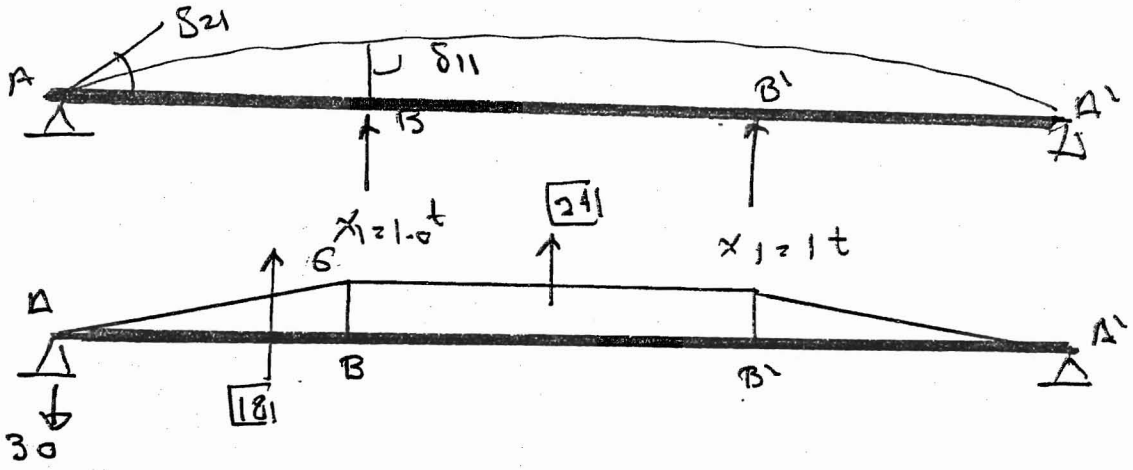




* $\delta_{10} = \frac{MB}{EI} = \frac{3960}{EI}$

* $\delta_{20} = \frac{QA}{EI} = \frac{840}{EI}$

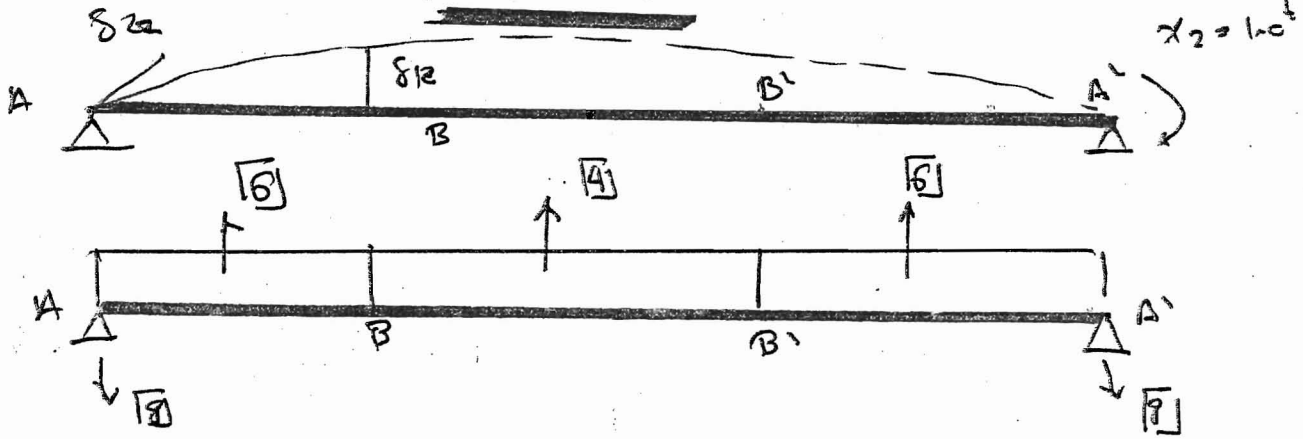
(4) Load (1)



* $\delta_{12} = \frac{MB}{EI} = \frac{-144}{EI}$

* $\delta_{21} = \frac{QA}{EI} = \frac{-30}{EI}$

(5) Load (2)



* $\delta_{12} = \frac{-30}{EI}$

* $\delta_{22} = \frac{-8}{EI}$

(6) Condition

at (B)

$\delta_{10} + \delta_{11} X_1 + \delta_{12} X_2 = 0.0$

$\frac{3960}{EI} - \frac{144}{EI} X_1 = \frac{30}{EI} X_2$

$144 X_1 + 30 X_2 = 3960 \rightarrow (1)$

at (A)

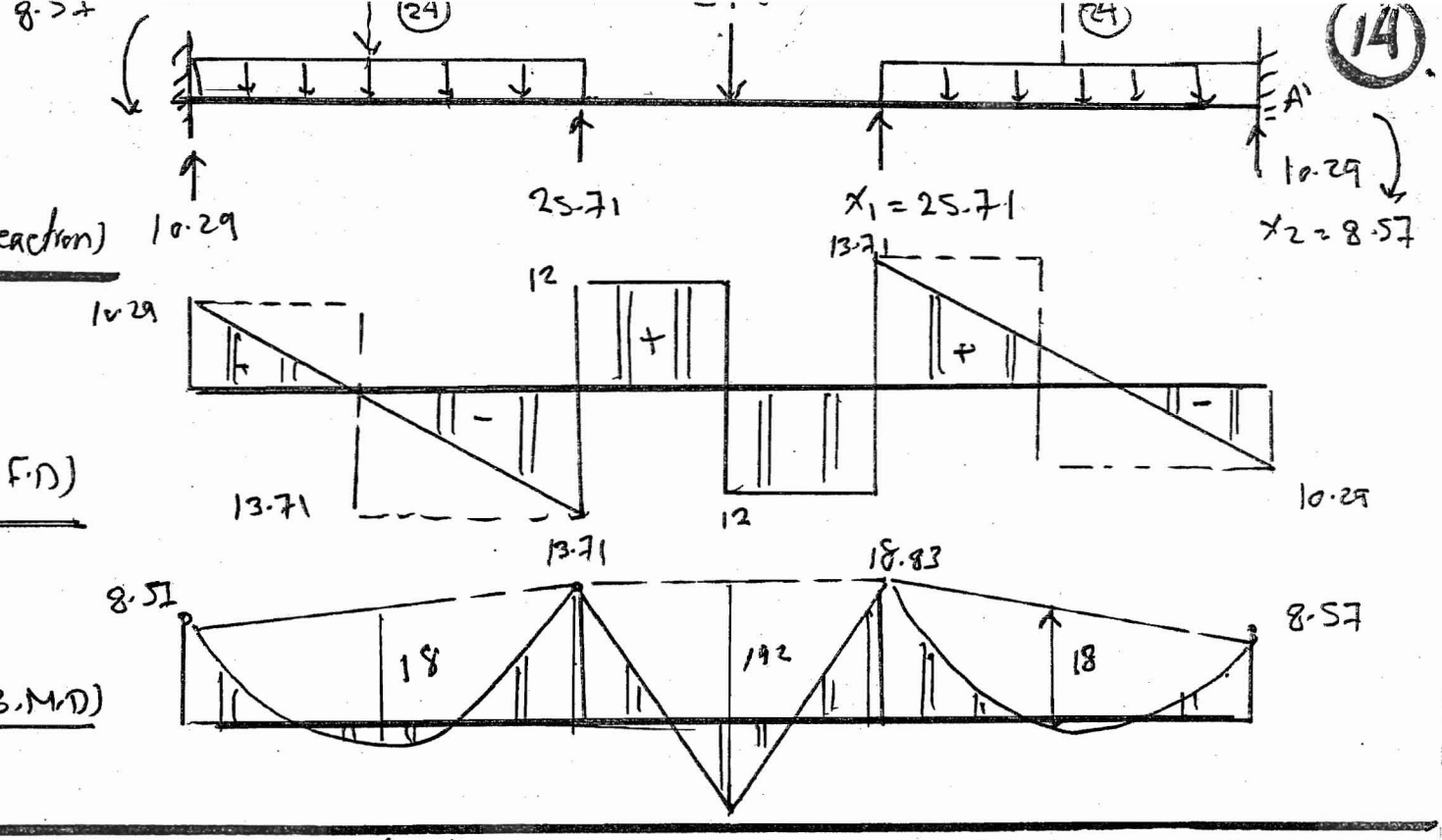
$\delta_{20} + \delta_{21} X_1 + \delta_{22} X_2 = 0.0$

$\frac{840}{EI} - \frac{30}{EI} X_1 - \frac{8}{EI} X_2 = 0.0$

$30 X_1 + 8 X_2 = 840 \rightarrow (2)$

* نجد المعادلتين (1) و (2) نحصل على

$MA = MA' = X_2 = 8.57 \text{ t.m}$



(ملحوظ ايجاد العزم نتيجه الهبوط فقط (هامه)

معناه لاتأخذ في الاعتبار الاحمال الأساسيه

$\star\ \delta_{10} = 0.0 \qquad \star\ \delta_{20} = 0.0$

• يوضع ($X_1 = 1.0\ t$) فيوجد (δ_{11} ، δ_{21})

$\star\ \delta_{11} = \frac{-144}{EI} \qquad \star\ \delta_{21} = \frac{-30}{EI}$

• يوضع ($X_2 = 1.0\ tm$) فيوجد (δ_{22} ، δ_{12})

$\star\ \delta_{12} = \frac{-30}{EI} \qquad \star\ \delta_{22} = \frac{-8}{EI}$

at (B) $\rightarrow$ $0.0 + \delta_{11} X_1 + \delta_{12} X_2 = \frac{0.5}{100}$ ↓ ضد عقرب الساعة

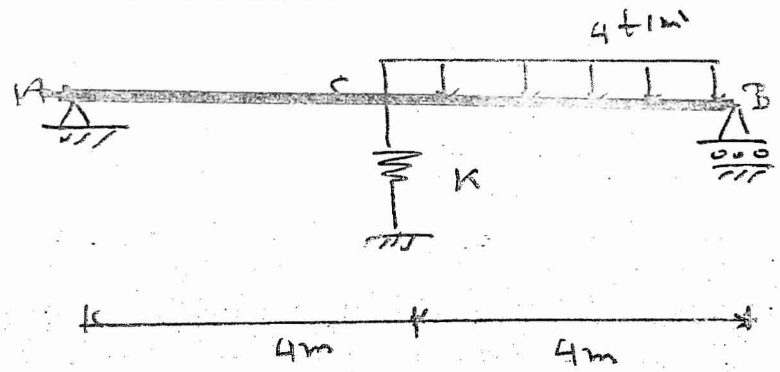
$\frac{-144}{EI} X_1 + \frac{-30}{EI} X_2 = 0.005 \rightarrow (1)$

at (A) $\rightarrow$ $0.0 + \delta_{21} X_1 + \delta_{22} X_2 = 0.0$ من (1) و (2) نحل

$X_1 = \quad X_2 =$

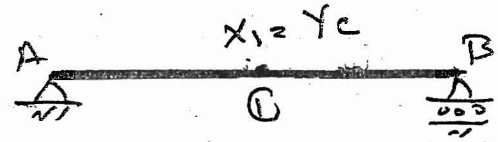
* احسب قيمة (K) جساءة الزنبرك التي تعطي هبوط عند (c) قدره ($\delta_c = 0.2cm$) ثم احسب Reactions, S.F.D, B.M.D

$EI = 10000\ t\,m^2$

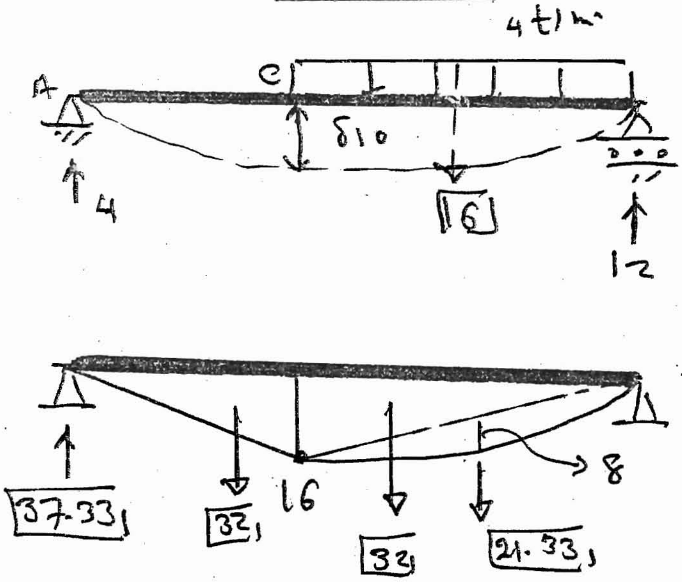


(1) Degree $D = 3 - 2 = 1$

(2) M.S

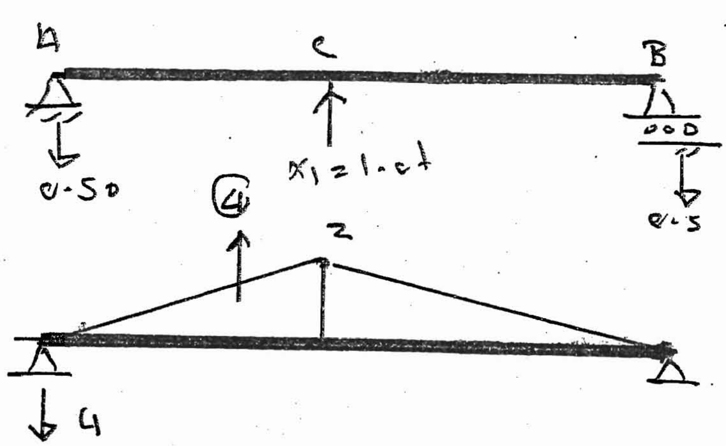


(3) Load (0)



$$* \ \delta_{10} = \frac{M_c}{EI} = \frac{106.67}{EI}$$

(4) Load (1)



$$* \ \delta_{11} = \frac{M_c}{EI} = \frac{-10\frac{2}{3}}{EI} =$$

(5) Condition

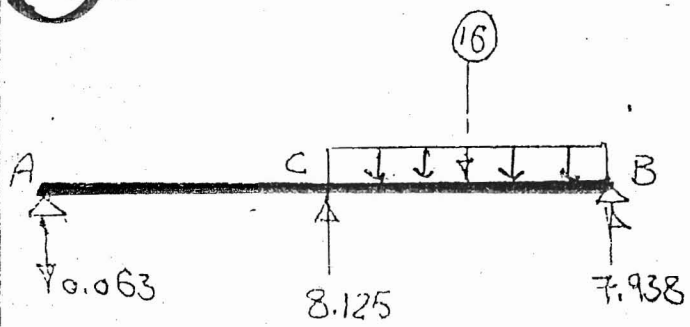
at (c) $\delta_{10} + X_1\,\delta_{11} = y_c$ → 0.2 cm given $= \frac{0.2}{100}$ m

$$\therefore \frac{106.67}{EI} - \frac{10.67}{EI} X_1 = 0.002 \quad \times EI$$

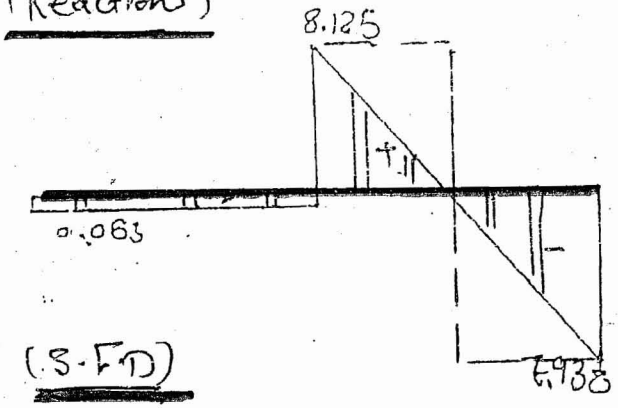
$$106.67 - 10.67 X_1 = 0.002 \times 10000$$

(15/16) $\therefore X_1 = (106.67 - 20)/10.67$ $\therefore X_1 = Y_c = 8.125^t$

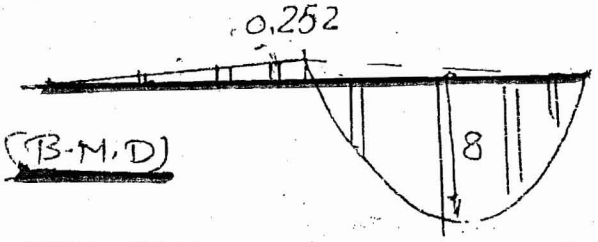
(16)



(Reactions)



(S.F.D)



(B.M.D)

(16/91)