

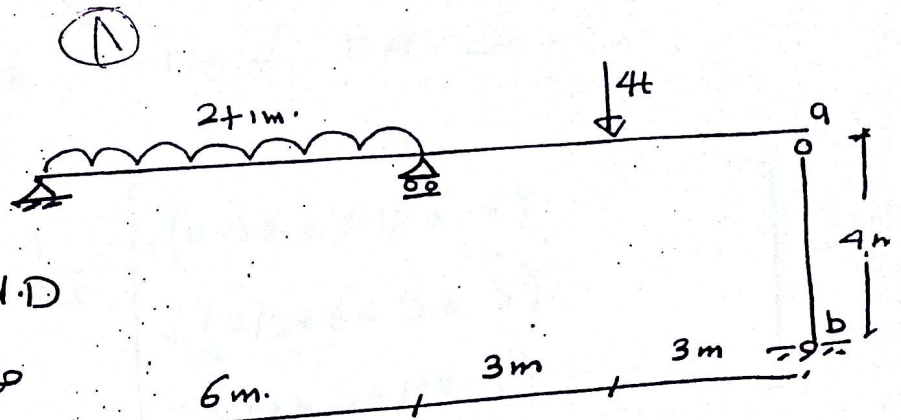
Revision (1):

Ex: 1

Draw SFD & BMD

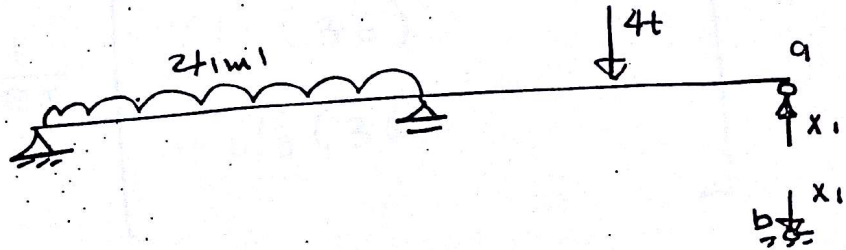
if 1) $EA_{link} = \infty$

2) $EA_{link} = \frac{EI}{2}$



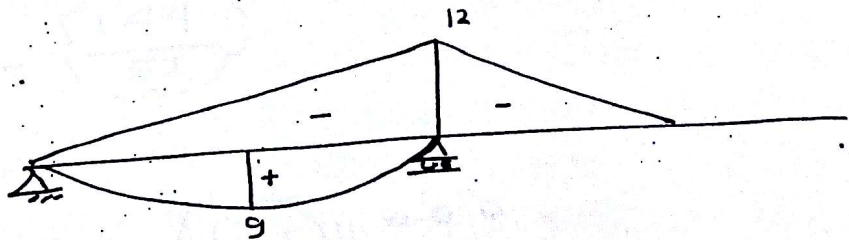
1 $R = 3 + 2 = 5$, $C = 3 + 1 = 4$ / $Red = 1$

2 M.S.



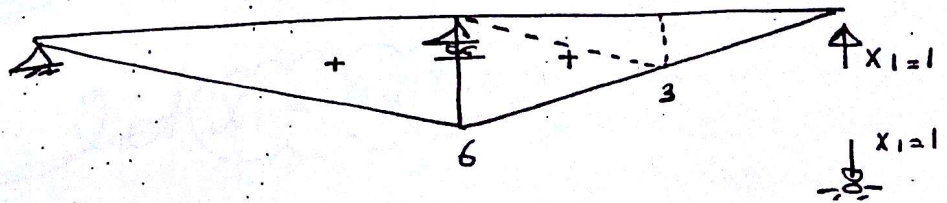
$\frac{\partial f}{\partial X_1} = 0.0$

$F_0 = 0.0$



$\frac{\partial f}{\partial X_1} = 1t$

$f_1 = 1t$



1

Case (1) link is rigid $EA = \infty$

$$\Delta_{10} = \frac{1}{EI} \left[\begin{aligned} &-(0.5 \times 6 \times 12 \times 4) \\ &+ (2/3 \times 6 \times 9 \times 3) \\ &-(1/2 \times 3 \times 12 \times 5) \end{aligned} \right]$$

$$= \frac{-126}{EI}$$

$$\Delta_{11} = \frac{1}{EI} \left[\begin{aligned} &6/3 (36) \\ &+ 6/3 (36) \end{aligned} \right]$$

$$= \frac{144}{EI}$$

$$\therefore \Delta_{10} + X_1 \Delta_{11} = 0.0$$

$$\frac{-126}{EI} + X_1 \frac{144}{EI} = 0.0$$

$$\text{get } X_1 = 0.875t$$

relative displacement
 بین النقطتين a, b وتمساواتها بالهندسة
 ان link بيننا Rigid فلا يوجد
 Relative displacement بينهما

وهذا القول باننا تم حساب الإزاحة
 الهندسية عند نقطتي a ومساواتها بالهندسة
 ان link رigid يعني اننا لم نحسب الإزاحة
 الهندسية

Case (2) link is flexible ($EA_{link} = EI/2$)

$$\Delta_{10} = \frac{1}{EI} \int M_0 M_1 dx + \frac{1}{EA} \sum f_0 f_1 l$$

$$= -\frac{126}{EI} + 0.0 = \frac{-126}{EI}$$

$$\Delta_{11} = \frac{1}{EI} \int M_1 M_1 dx + \frac{1}{EA} \sum f_1 f_1 l$$

$$= \frac{144}{EI} + \frac{1 \times 1 \times 4}{0.5EI} = \frac{152}{EI}$$

$$\Delta_{10} + X_1 \Delta_{11} = 0.0$$

$$\frac{-126}{EI} + X_1 \times \frac{152}{EI} = 0.0$$

$$\therefore X_1 = \frac{126}{152} = 0.83t$$

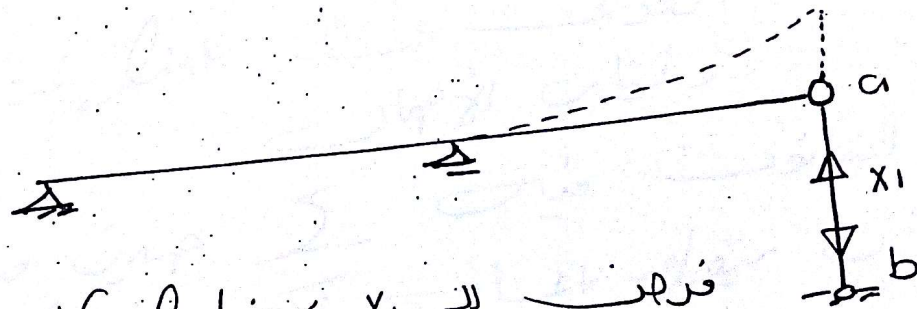
3

در حد اولی به صبح معین به حساب می آید

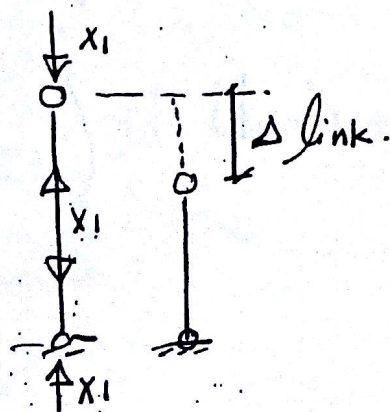
اینست که ما در Relative displacement بین انتهای
 a, b و ما را می دهد Δ الحادته داخل در link
 و لهذا بین آن لحادته Δ می باشد که است

$$\sum I_0 + X_1 \left(\frac{1}{EI} \right) M_{mid} = \ominus \left(\frac{X_1 l}{E.A} \right) \Delta_{link}$$

و اینست که ما در Beam عین Δ الحادته Δ link
 و اینست که ما در Beam عین Δ الحادته Δ link



فرض کنیم X_1 به شکل Δ الحادته Δ link
 نقطه a سوف تغییر Δ link
 بینا Δ link Δ الحادته Δ link
 و اینست که ما در Δ link Δ link



معمولات هامة :
 انتخبت للفرق فقط وليس ذلك
 بين اكد كالتار من ان

4 حالات ان در link نوع Flexible

$$\delta_{10} = 1/EI \int M_0 M_1 dx + 1/EA \sum f_0 f_1 l$$

f_0 : القوت في در links بتدبير الزهار
 at $X_1 = 0.0$

f_1 : القوت في در link بتدبير $X_1 = H$
 ونجيب الزهار والقانون في

ان سيقول بالمات اكثر من (link)
 في حالي و يوجد link واحد وكانت القوت

بالحال في در X_1 نوع

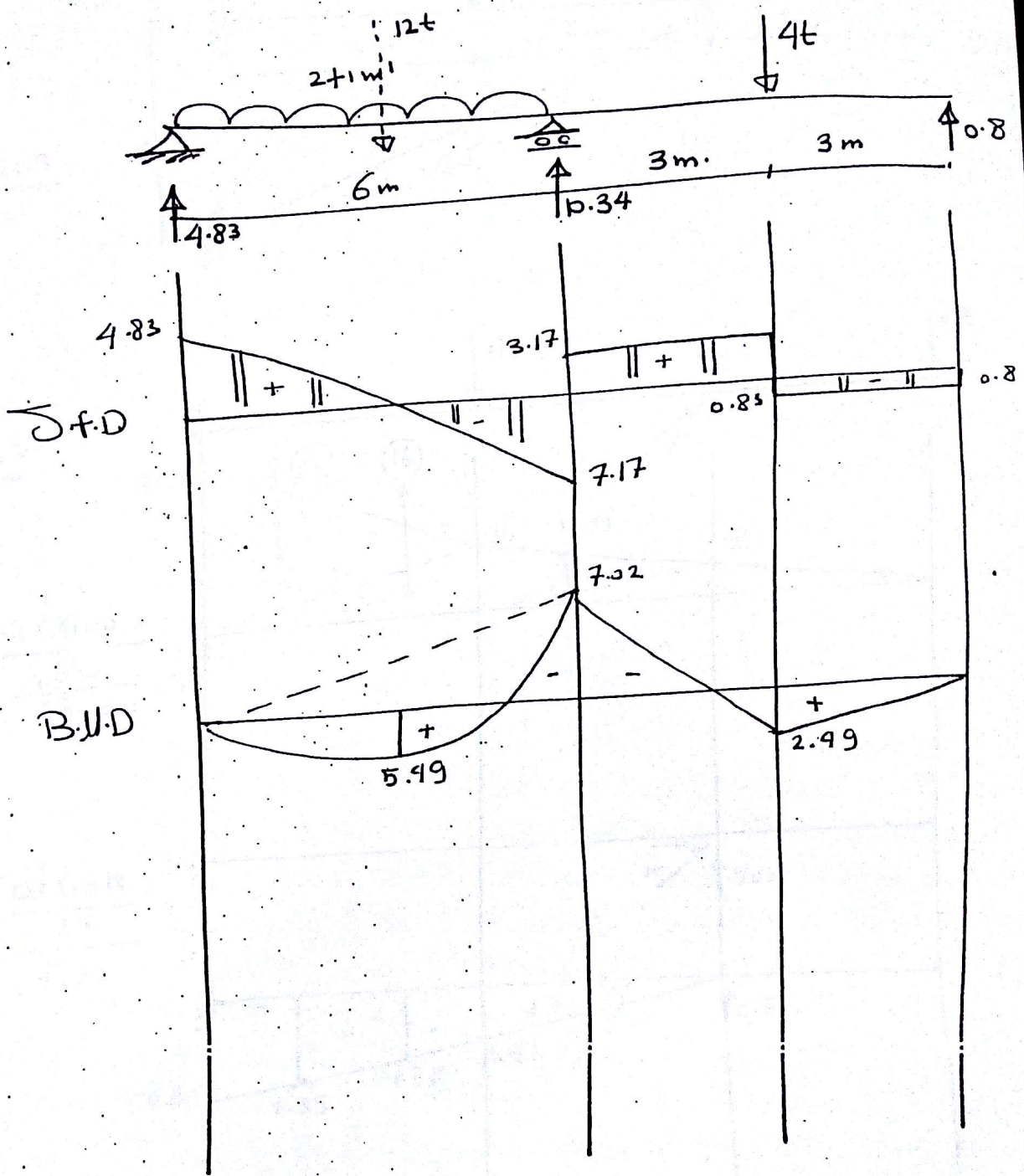
$$\begin{aligned} f_0 &= 0.0 \\ f_1 &= 1.0 \end{aligned}$$

$$\delta_{11} = 1/EI \int M_1 M_1 dx + 1/EA \sum f_1 f_1 l$$

وتكون الحالت

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

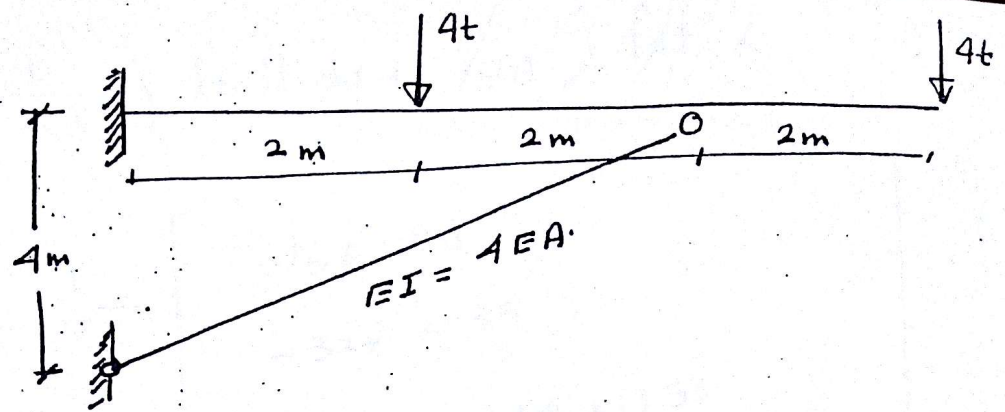
SFD & B.M.D in case of influence line



$$R = 5$$

$$C = 3 + 1 = 4$$

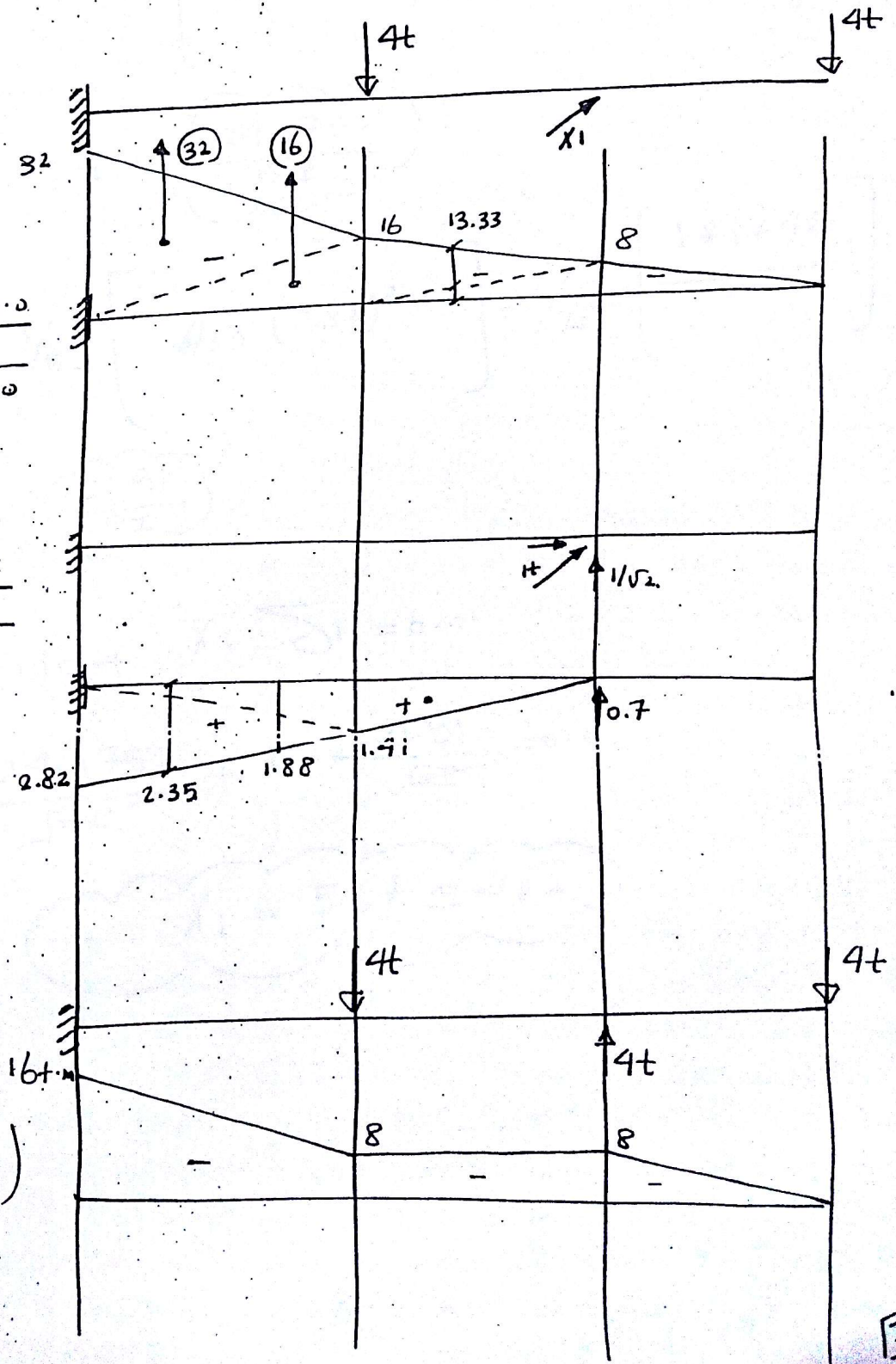
$$Red = 1$$



M.S.:

$$\frac{atx_1 = 0.0}{\frac{M_0}{F_0 = 0.0}}$$

$$\frac{atx_1 = H}{\frac{M_1}{f_1 = 1}}$$



(final B.M.D.)

$$\delta_{10} = \frac{1}{EI} \int M_0 M_1 dx + \frac{1}{EA} \sum_{0.0}^{f/f.1} f/f.1$$

$$= \frac{1}{EI} \left[\begin{array}{l} -16 \times 1.88 \\ -32 \times 2.35 \\ -0.5 \times 2 \times 1.41 \times 13.33 \end{array} \right]$$

$$= \frac{-124.0753}{EI}$$

$$\delta_{11} = \frac{1}{EI} \left[\frac{4}{3} (2.82)^2 \right] + \frac{1}{\frac{1}{4}EI} \left[\frac{1 \times 1 \times 4\sqrt{2}}{1} \right]$$

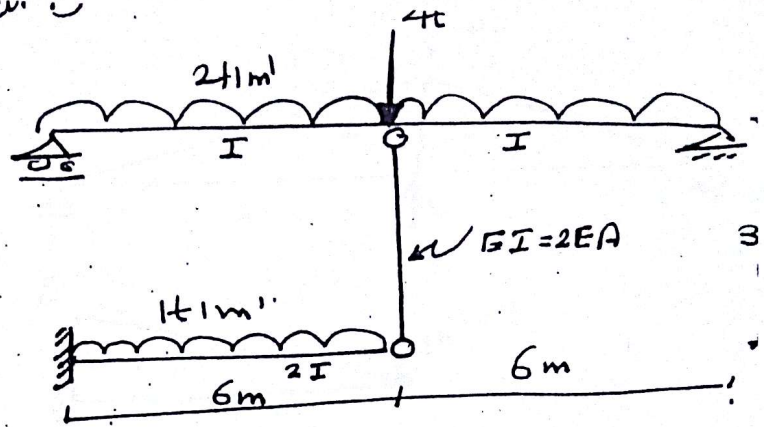
$$= \frac{21.91}{EI}$$

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

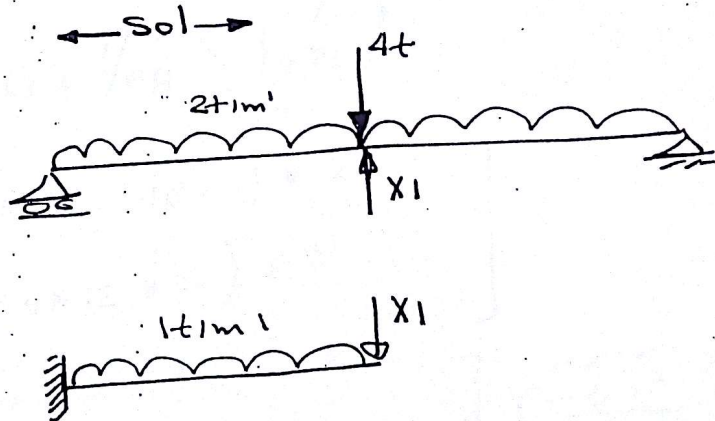
$$\frac{-124.0753}{EI} + X_1 \times \frac{21.91}{EI} = 0.0$$

$$\therefore X_1 = 5.67 \approx 4\sqrt{2}$$

Draw OTD and SD

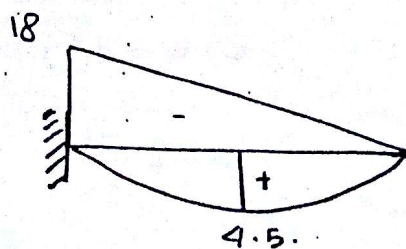
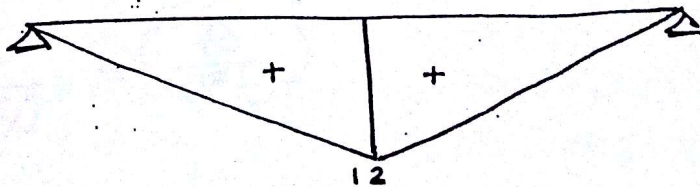
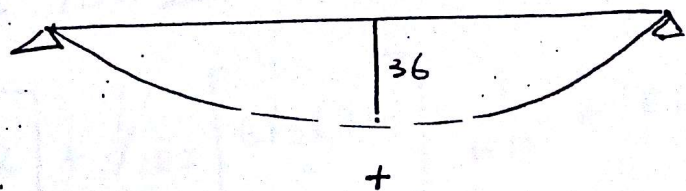


1) M.S.



2) $\Delta X_1 = 0.0, M_0, (F_0 = 0.0)$

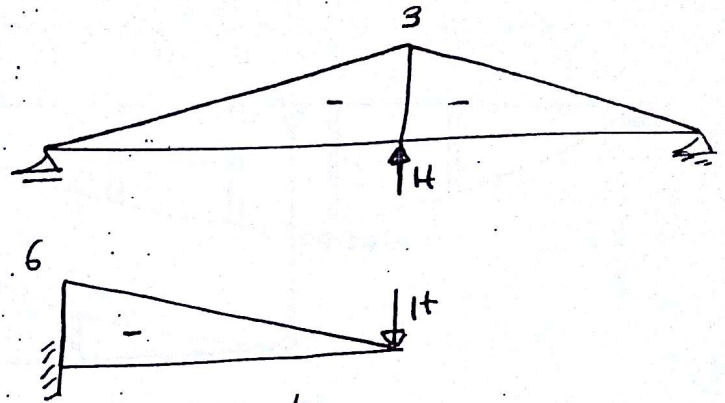
M₀



9

at $x_1 = H, M_1, t_1 = 1$

M_1



$$\begin{aligned} \delta_{10} &= \frac{1}{EI} \int M_0 M_1 dx + \frac{1}{EA} \sum f_0 f_1 l \\ &= \frac{1}{EI} \left[-\left(\frac{2}{3} \times 6 \times 36 \times \frac{5}{18} \times 3 \right) \times 2 \right. \\ &\quad \left. - \left(0.5 \times 6 \times 12 \times 2 \right) \times 2 \right] \\ &\quad + \frac{1}{2EI} \left[\left(0.5 \times 6 \times 18 \times 4 \right) \right. \\ &\quad \left. - \left(\frac{2}{3} \times 6 \times 4.5 \times 3 \right) \right] = \frac{-603}{EI} \end{aligned}$$

$$\begin{aligned} \delta_{11} &= \frac{1}{EI} \int M_1 M_1 dx + \frac{1}{EA} \sum f_1 f_1 l \\ &= \frac{1}{EI} \left[6 \times 3 \times 3 \times 2 \right] + \frac{1}{2EI} \left[6 \times 3 \times 3 \right] + \frac{1}{EA} \times 1 \times 1 \times 3 \\ &= \frac{72}{EI} + \frac{3}{EI/2} = \frac{78}{EI} \end{aligned}$$

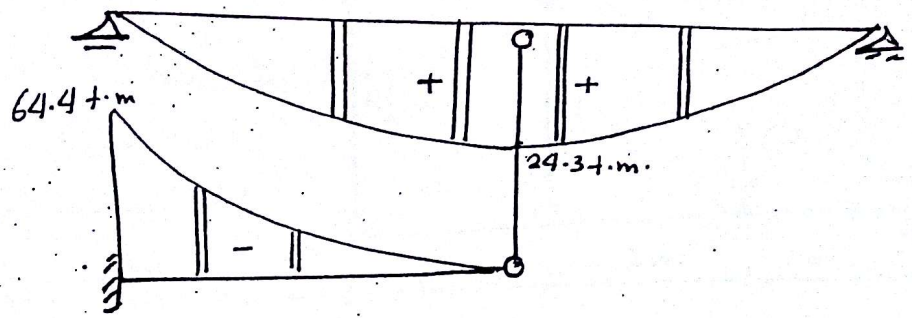
$$\delta_{10} + X_1 \delta_{11} = 0.0$$

$$\frac{-603}{EI} + X_1 \cdot \frac{78}{EI} = 0.0$$

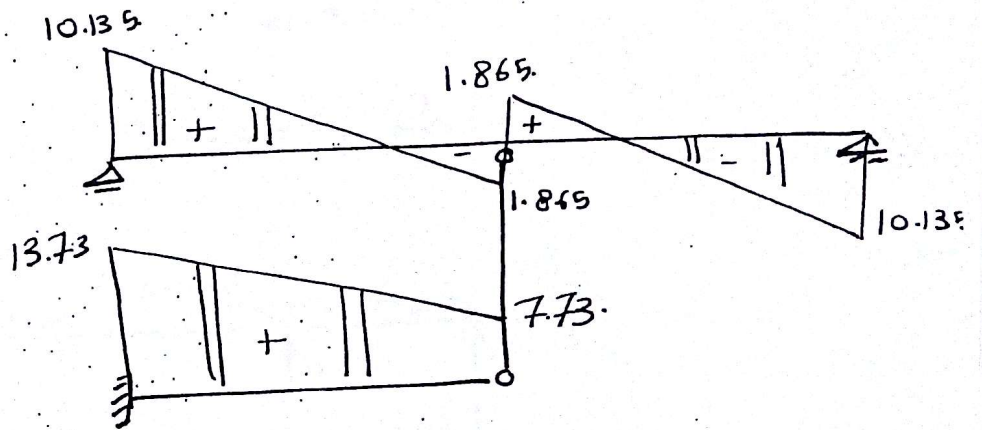
$$\therefore X_1 = 7.73t$$

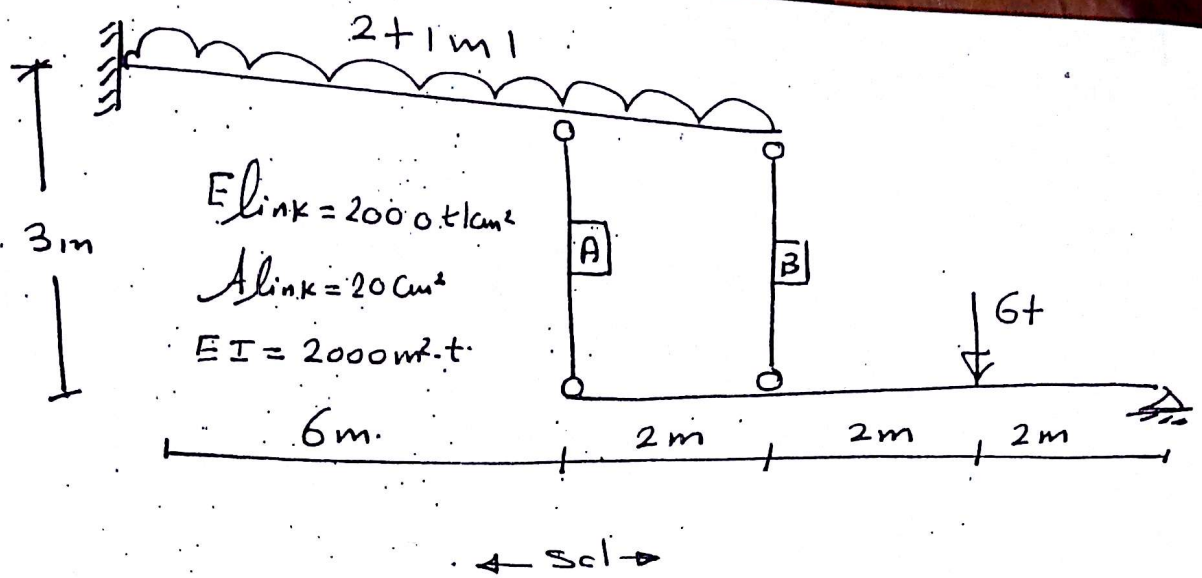
10

B.M.D



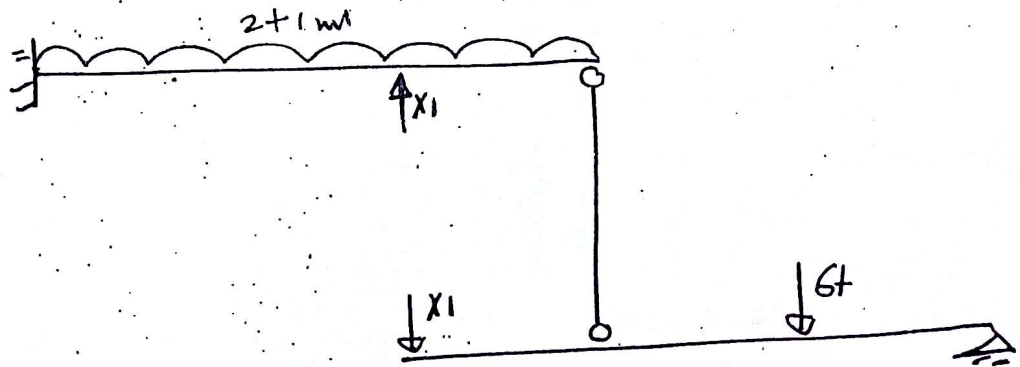
S.F.D



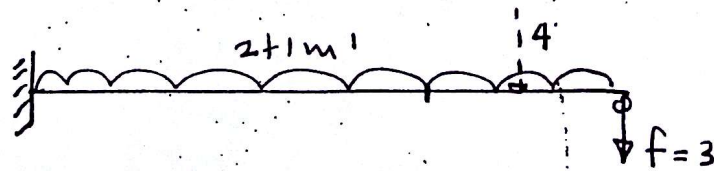


$$R = 5 + 3 = 8, \quad C = 3 + 4 = 7, \quad Red = 1$$

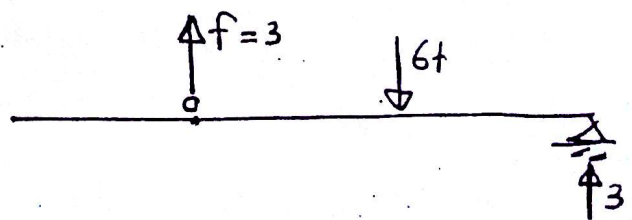
1 M.S.



2 at $x_1 = 0.0$, M_0, F_0 :



$F_0 A = 0.0$
 $f_0 B = +3$



12