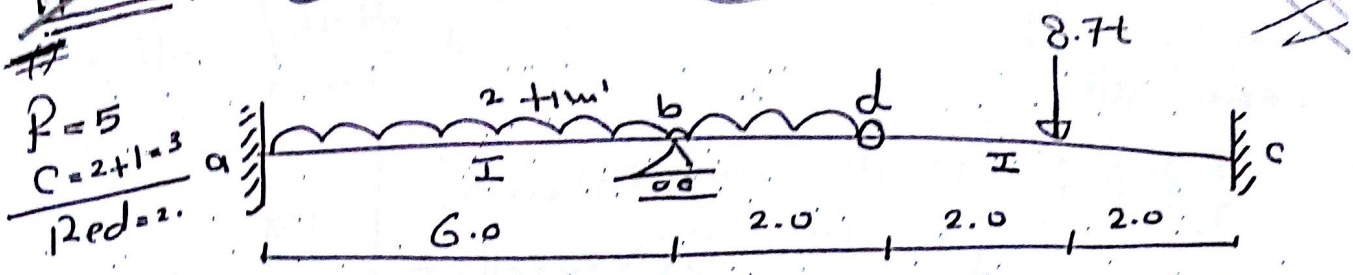
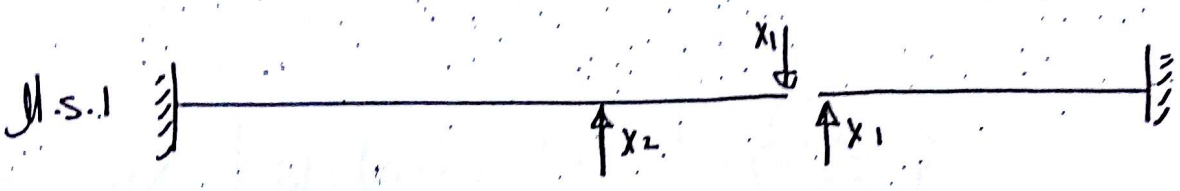
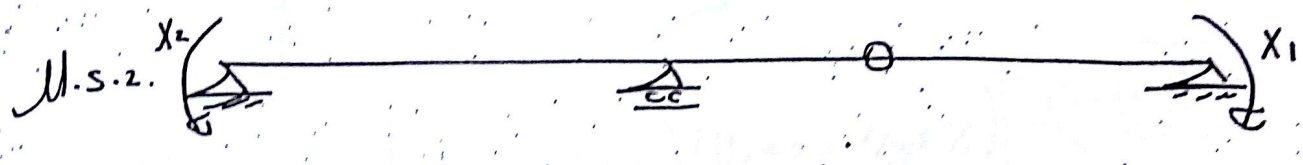
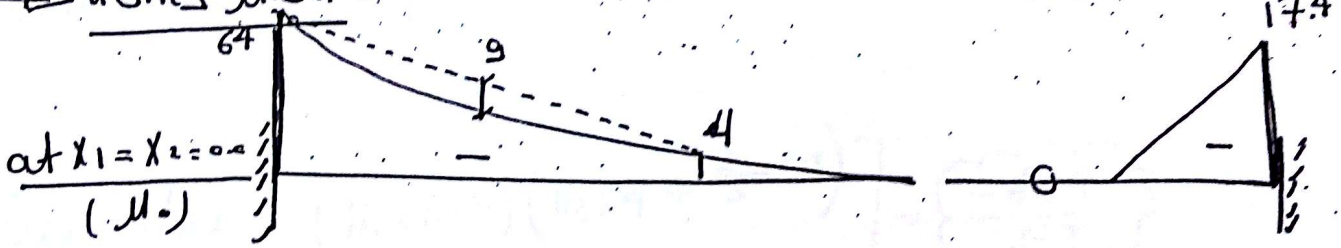
Ex:1 . Draw B.M.D

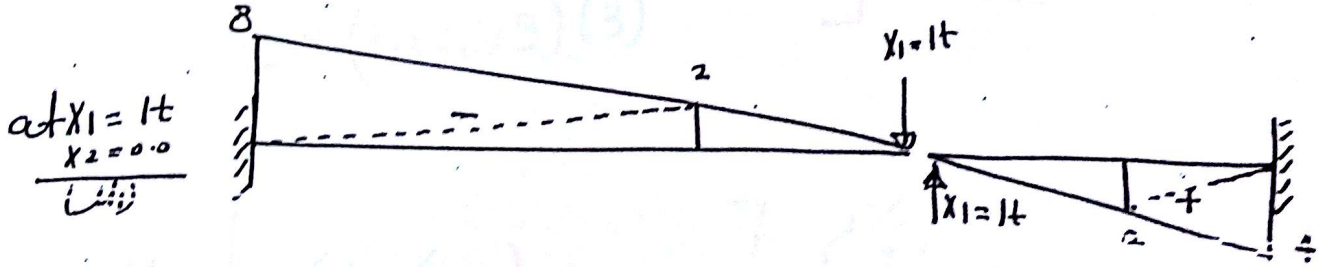


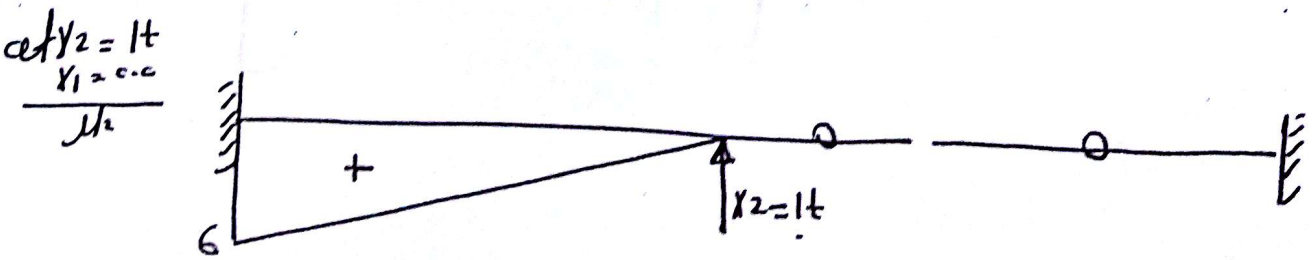


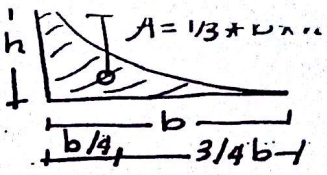


⇒ using M.S.1 :









$$\delta_{10} = \int \frac{M_1 M_0}{EI}\, dx$$

$$= \frac{1}{EI}\left[\begin{array}{l} -(1/2 * 2 * 17.4)\,(1/3 * 2 + 2/3 * 4) \\ +(1/3 * 8 * 64)\,(3/4 * 8) \end{array}\right] = \frac{+966}{EI}$$

$$\delta_{11} = 1/EI\left[8/3\,(64) + 4/3\,(16)\right] = \frac{192}{EI}$$

$$\delta_{12} = \delta_{21} = 1/EI\left[-(1/2 * 6 * 6)(1/3 * 2 + 2/3 * 8)\right] = \frac{-108}{EI}$$

$$\delta_{20} = 1/EI\left[\begin{array}{l} -(1/2 * 6 * 6)(1/3 * 4 + \frac{2}{3} * 64) \\ +(2/3 * 6 * 9)\,(3) \end{array}\right] = \frac{-684}{EI}$$

$$\delta_{22} = 1/EI\left[\; 6/3\;(36) \;\right] = \frac{72}{EI}$$

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

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

$$966 + 192 X_1 + 108 X_2 = 0.0 \longrightarrow \boxed{1}$$

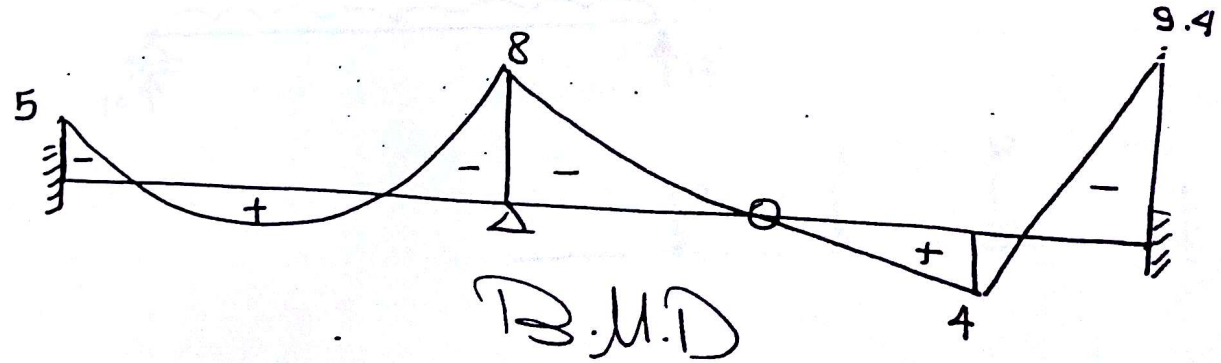
$$-684 - 108 X_1 + 72 X_2 = 0 \longrightarrow \boxed{2}$$

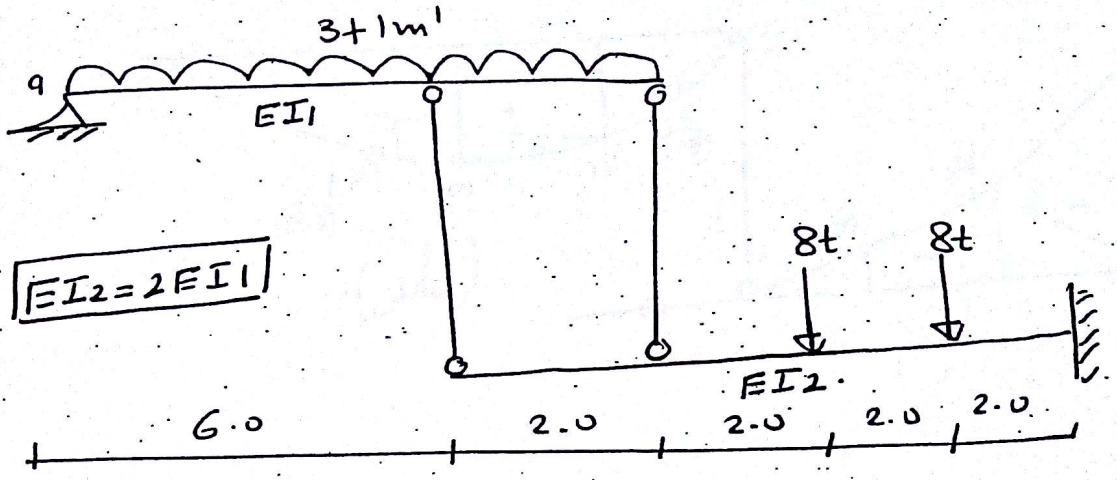
by Solving ① & ② get

$X_1 = 2t$

$X_2 = 12.5t$

$$M_f = M_0 + 2M_1 + 12.5M_2$$

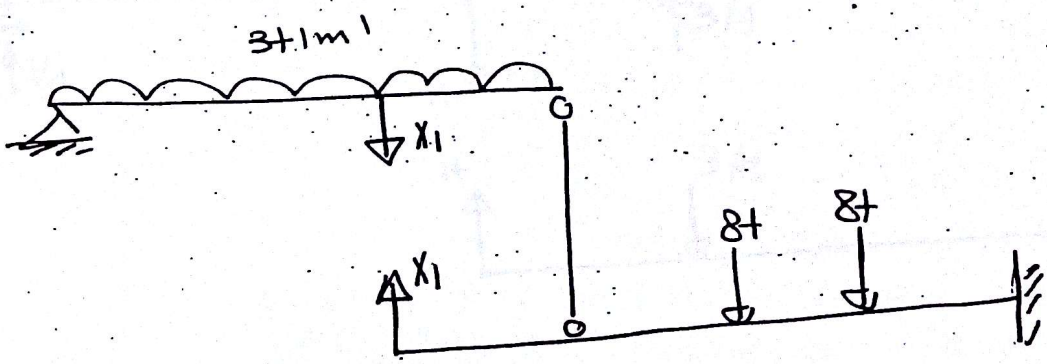




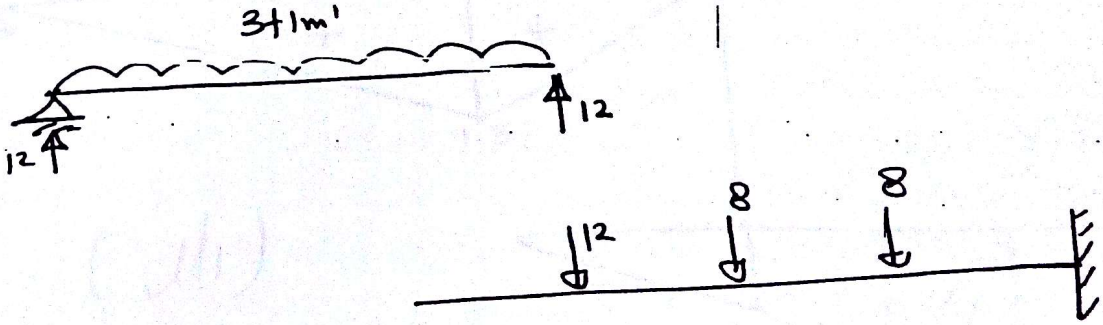
$EI_2 = 2EI_1$

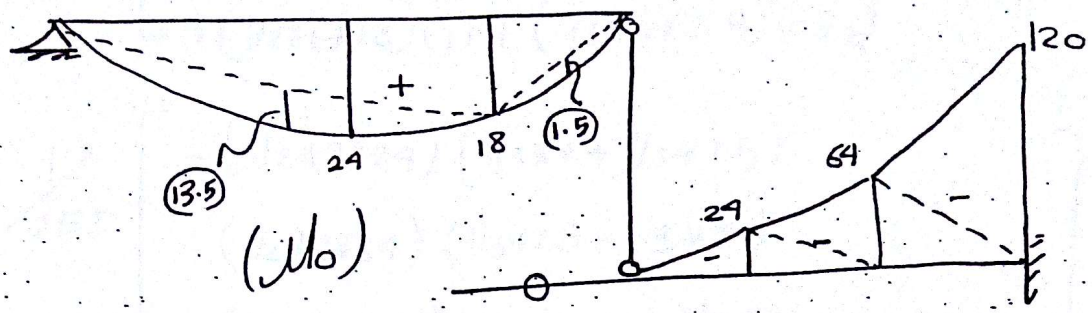
$R = 8,\ C = 3+4 = 7 \ \therefore \ Red = 1$

M.S:



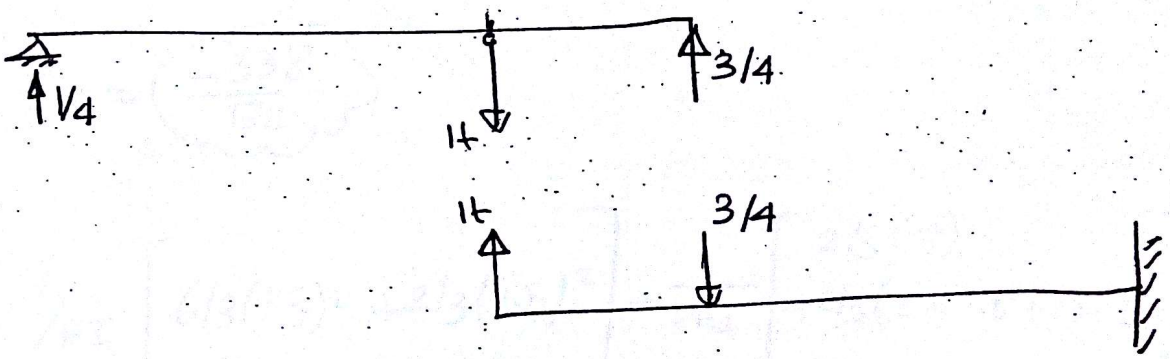
at $X_1 = 0.0$, M_0

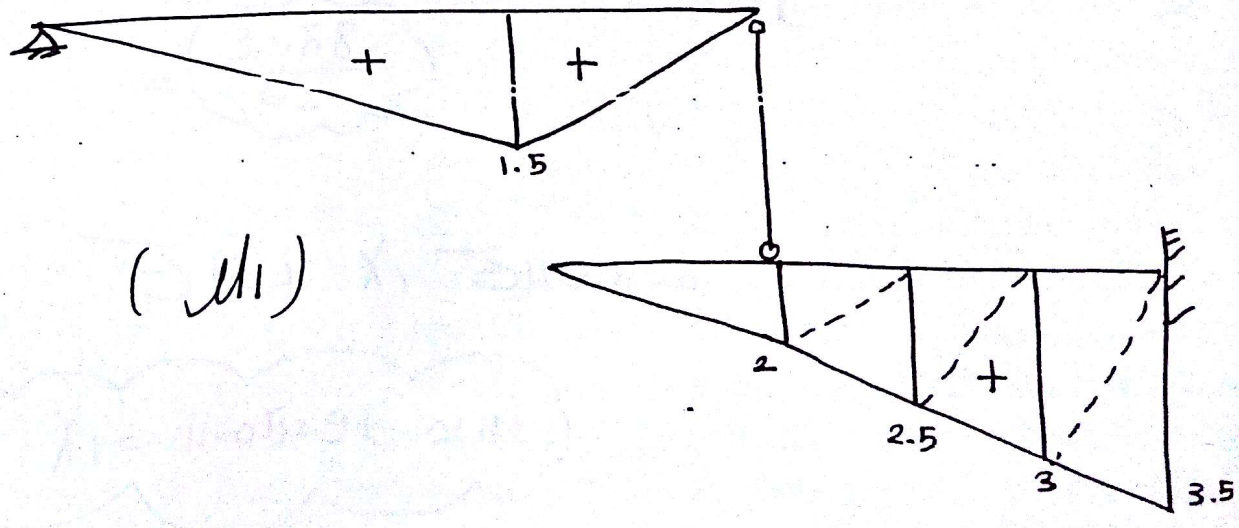




(M_0)

at $V_1 = 1t$:





(M_1)

$$\delta_{10} = \frac{1}{EI}\left[+\left(\tfrac{1}{2}*2*18*(1)\right)+\left(\tfrac{2}{3}*2*1.5\right)(0.75)\right.$$
$$\left.+\left(\tfrac{1}{2}*6*18\right)(1)+\left(\tfrac{2}{3}*6*13.5\right)(0.75)\right]$$

$$+\frac{1}{2EI}\left[\begin{array}{l}-\left(\tfrac{1}{2}*2*24\right)\left(\tfrac{1}{3}*2+\tfrac{2}{3}*2.5\right)\\ -\left(\tfrac{1}{2}*2*24\right)\left(\tfrac{2}{3}*2.5+\tfrac{2}{3}*3\right)\\ -\left(\tfrac{1}{2}*2*64\right)\left(\tfrac{1}{3}*2.5+\tfrac{2}{3}*3\right)\\ -\left(\tfrac{1}{2}*2*64\right)\left(\tfrac{2}{3}*3+\tfrac{1}{3}*3.5\right)\\ -\left(\tfrac{1}{2}*2*120\right)\left(\tfrac{1}{3}*3+\tfrac{2}{3}*3.5\right)\end{array}\right]$$

$$= \frac{-338}{EI}$$

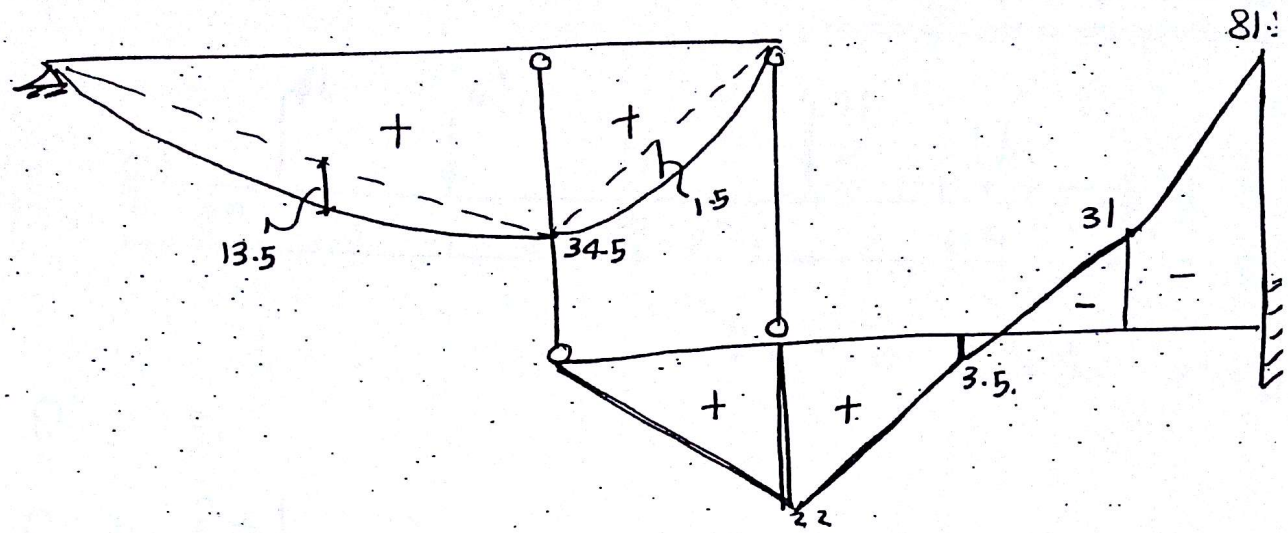
$$\delta_{11} = \frac{1}{EI}\left[\tfrac{2}{3}(1.5)^2+\tfrac{2}{3}(1.5)^2\right]+\frac{1}{2EI}\left[\begin{array}{l}\tfrac{2}{3}(9)\\ +\tfrac{2}{3}(2^2+2.5^2+2*2.5)\\ +\tfrac{2}{3}(2.5^2+3^2+2.5*3)\\ +\tfrac{2}{3}(3^2+3.5^2+3*3.5)\end{array}\right]$$

$$= \frac{30.58}{EI}$$

$$\delta_{10} + X_1\,\delta_{11} = 0 \quad \text{---}$$

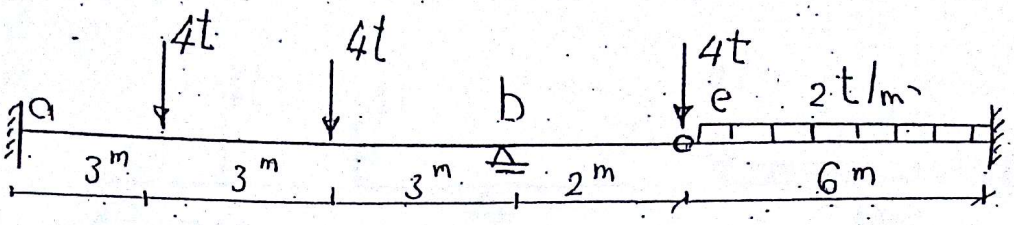
$$\therefore X_1 = 11.0529t \simeq 11t$$

$$M_f = M_0 + 11\,M_1$$



B.M.D

مثال بها مجهولين

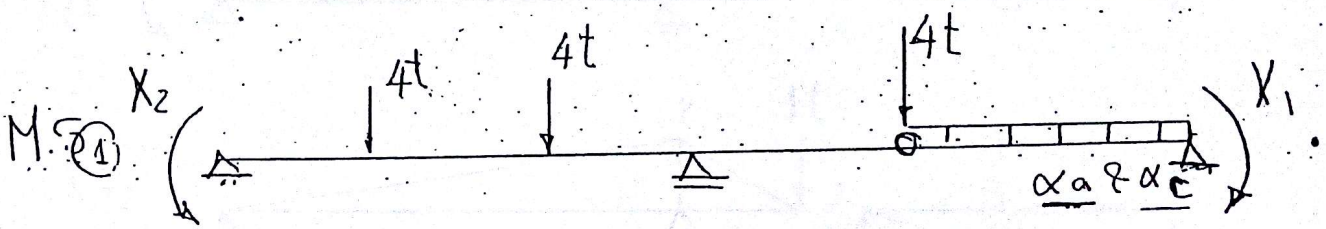


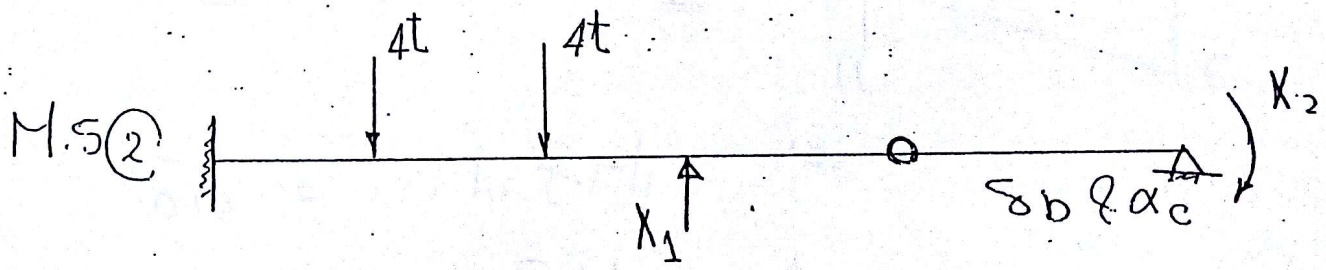
1) اوجد تفاعلات S.M

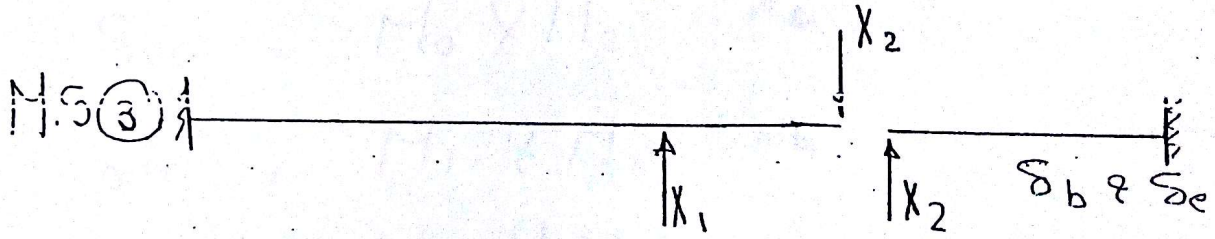
$R = 5$

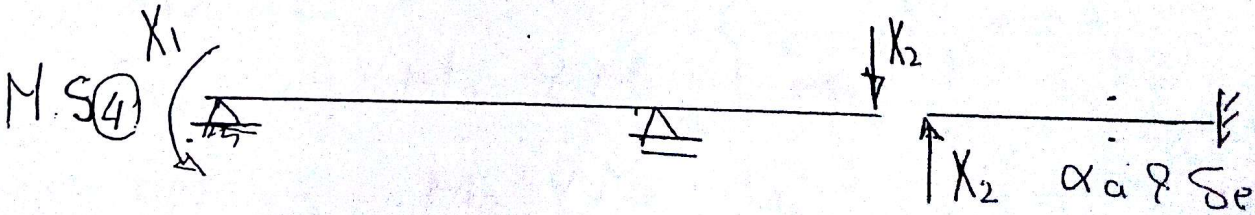
$C = 2 + 1$

2^{nd} degree

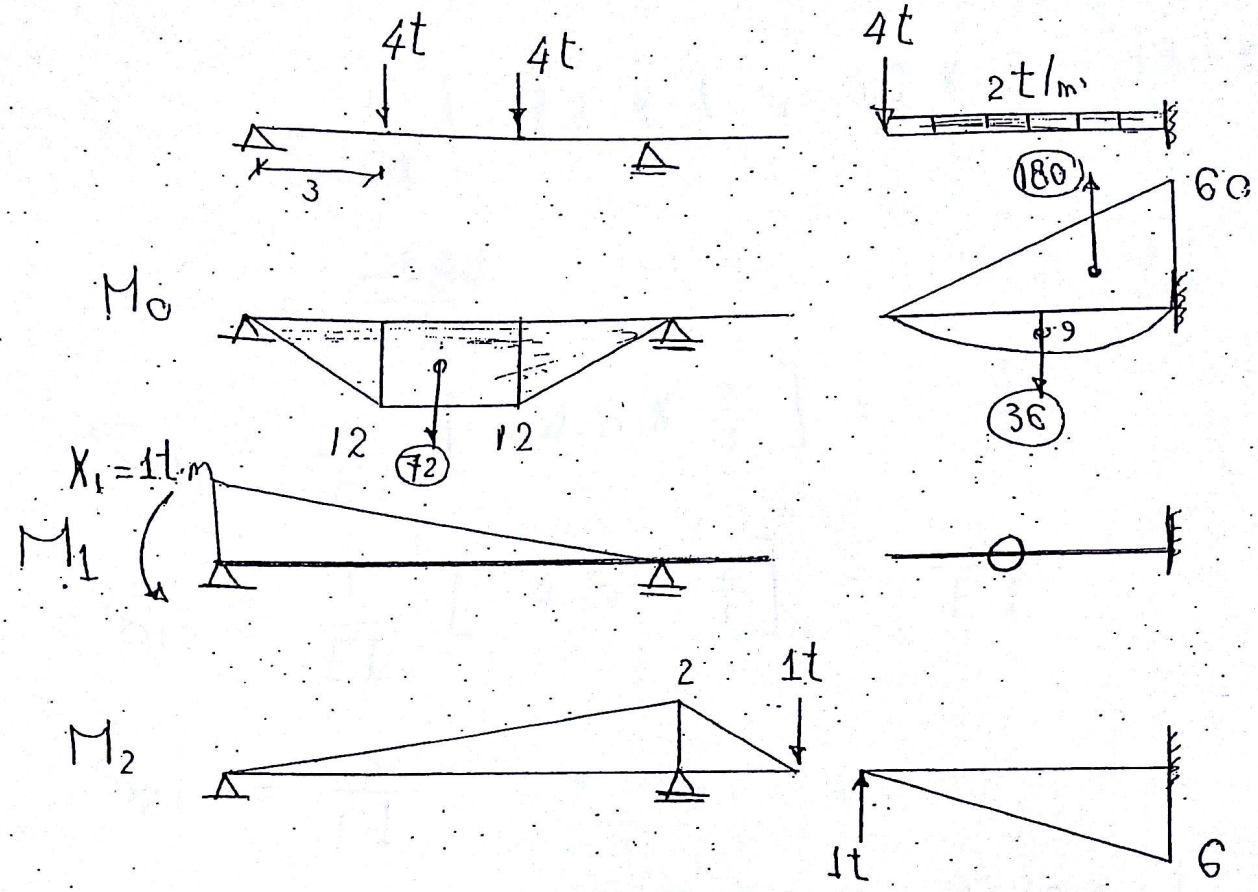








٤) اختار احد M.S وارسم B.M.D



$\delta_{10} = M_0 \& M_1$ M_{b_0}

$\delta_{20} = M_0 \& M_2$ M_{c_0}

$\delta_{11} = M_1 \& M_1$ M_{b_1}

$\delta_{12} = M_1 \& M_2$ } M_{b_2} يساوي بعكس

$\delta_{21} = M_2 \& M_1$ }

$\delta_{22} = M_2 \& M_2$ M_{b_2}

$$\delta_{10} + X_1 \delta_{11} + X_2 \delta_{12} = 0$$

$$\delta_{20} + X_1 \delta_{21} + X_2 \delta_{22} = 0$$

$$\delta_{10} = \frac{1}{EI}\left[-72 * 0.5\right] = \frac{-36}{EI}$$

$$\delta_{20} = \frac{1}{EI}\left[-72 * 1 + 36 * 3 - 180 * 4 \text{ val in}\right.$$

$$= \frac{-684}{EI}$$

$$\delta_{11} = \frac{1}{EI}\left[4.5 * \frac{2}{3}\right] = \frac{3}{EI}$$

$$\delta_{12} = \frac{1}{EI}\left[4.5 * \frac{2}{3}\right] = \frac{3}{EI}$$

$$\delta_{21} = \frac{3}{EI}$$

$$\delta_{22} = \frac{1}{EI}\left[9 * \frac{4}{3} + 2 * \frac{4}{3} + 18 * 4\right] = \frac{86.}{EI}$$

$$\delta_{10} + X_1 \delta_{11} + X_2 \delta_{12} = 0$$

$$\frac{-36}{EI} + X_1\left(\frac{3}{EI}\right) + X_2\left(\frac{3}{EI}\right) = 0$$

$$\boxed{3X_1 + 3X_2 = 36} \longrightarrow (1)$$

$$\delta_{20} + X_1 \delta_{21} + X_2 \delta_{22} = 0$$

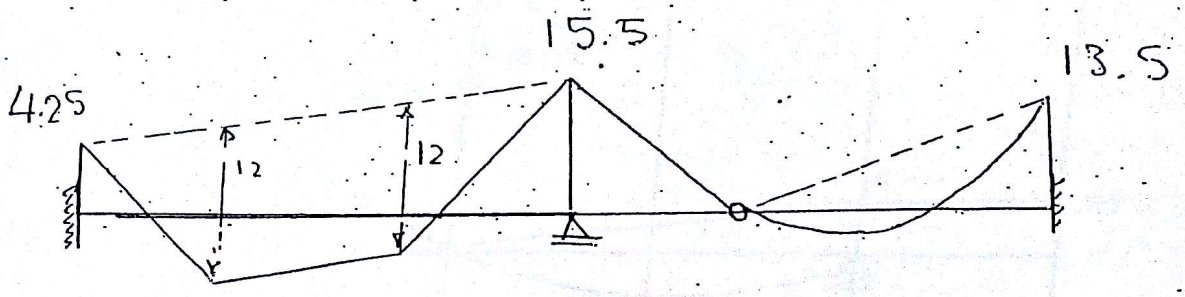
$$\frac{-684}{EI} + X_1\left(\frac{3}{EI}\right) + X_2\left(\frac{86.66}{EI}\right) = 0$$

$$3X_1 + 86.66X_2 = 684 \quad \rightarrow (2)$$

$$X_1 = 4.25$$

$$X_2 = 7.75$$

$$M_{Final} = M_0 + X_1 M_1 + X_2 M_2$$



M_{Final}