NAME:-

NAVEED AHMAD

I.D :- 7880

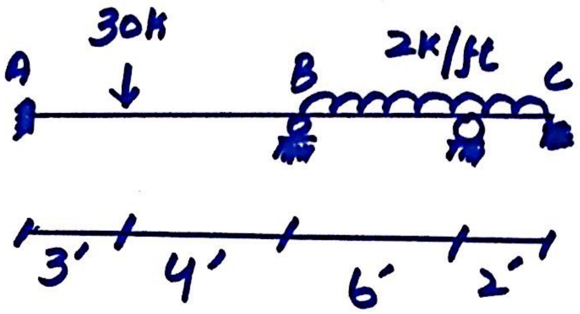
SUBJECT:-

STRUCTUR II.

SEMS:- SUMMER - FINAL

DEPTT:- CIVIL.

QUISTION- 01

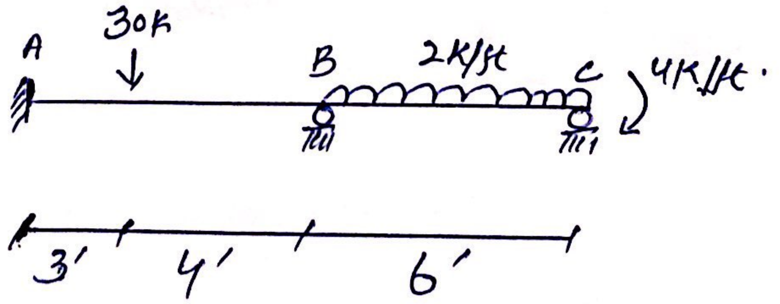


SOLUTION-

$K \cdot I = ?$

$KI = 5^{\circ}$

we have to reduce the extended portion.

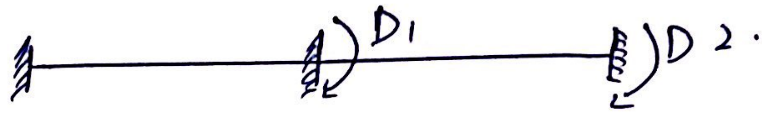


$$\Rightarrow \frac{2(2)}{1} = 4 \text{ k·ft.}$$

Now $K \cdot I = 2^{\circ}$

STEP II :-

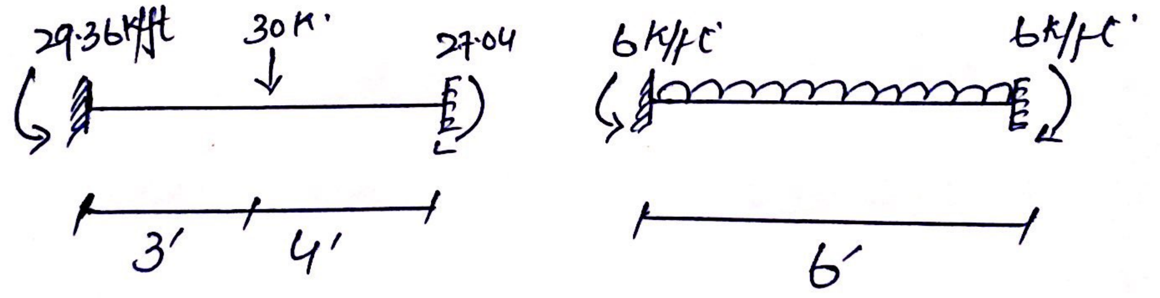
Determine unknown joint displacements



$$\begin{bmatrix} D_1 \\ D_2 \end{bmatrix} = \begin{bmatrix} ? \\ ? \end{bmatrix} . \quad \begin{bmatrix} AD_1 \\ AD_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 4 \end{bmatrix}$$

STEP III :-

Compute ADL matrix



For pointed load

For left ~~hand~~ end.

$$\frac{Pab^2}{L^2} = \frac{(30)(3)(4)^2}{(7)^2} \Rightarrow 29.38 \text{ k/ft.}$$

for right End

$$\frac{Pa^2b}{L^2} = \frac{(30)(3)^2(4)}{(7)^2} = 22.04 \text{ k/ft.}$$

for UDL

$$\frac{wL^2}{12} \Rightarrow \frac{(2)(6)^2}{12} = 6 \text{ k/ft.}$$

$ADL_1 = 22.04 - 6 = 16.04$ k/ft.

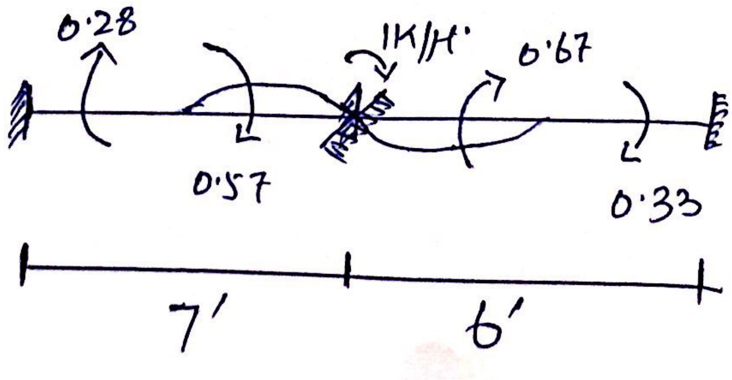
$ADL_2 = 6$ k.ft.

STEP IV :-

Compute [S] matrix

$$S = \begin{bmatrix} S_{11} & S_{12} \\ S_{21} & S_{22} \end{bmatrix}$$

a) $D_1 = 1K$, $D_2 = 0$.



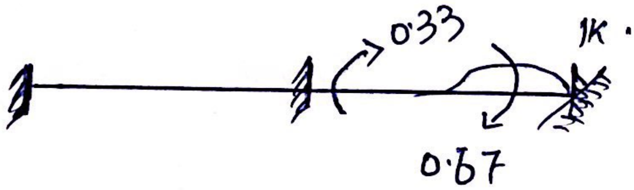
$\frac{4EI}{7} = 0.57$ $\frac{2EI}{6} = 0.33$

$\frac{4EI}{6} = 0.67.$ $\frac{2EI}{7} = 0.28.$

$S_{11} = 0.57 + 0.67$
$= 1.24\ EA.$

$S_{21} = 0.33\ EA.$

D) $D_1 = 0$ $D_2 = 1K$



$\frac{4EI}{6} = 0.67.$

$\frac{2EI}{6} = 0.33$

$S_{12} = 0.33$
$S_{22} = 0.67.$

$$S = \begin{bmatrix} 1.24 & 0.33 \\ 0.33 & 0.67 \end{bmatrix}$$

STEP V :-

Compute [D] matrix

$$\begin{bmatrix} D_1 \\ D_2 \end{bmatrix} = \begin{bmatrix} S_{11} & S_{12} \\ S_{21} & S_{22} \end{bmatrix}^{-1} \times \begin{bmatrix} AD1 \\ AD2 \end{bmatrix} - \begin{bmatrix} ADL1 \\ ADL2 \end{bmatrix}$$

$$\frac{1}{\begin{bmatrix} 1.24 & 0.33 \\ 0.33 & 0.67 \end{bmatrix}} \times \text{adj } A \times \begin{bmatrix} 0 \\ 4 \end{bmatrix} - \begin{bmatrix} 16.04 \\ 6 \end{bmatrix}$$

$$|S| = (1.24 \times 0.67) - (0.33 \times 0.33)$$

$$= 0.8308 - 0.1089$$

$$|S| = 0.7219$$

$$\text{Adj } A = \begin{bmatrix} 0.67 & -0.33 \\ -0.33 & 1.24 \end{bmatrix}$$

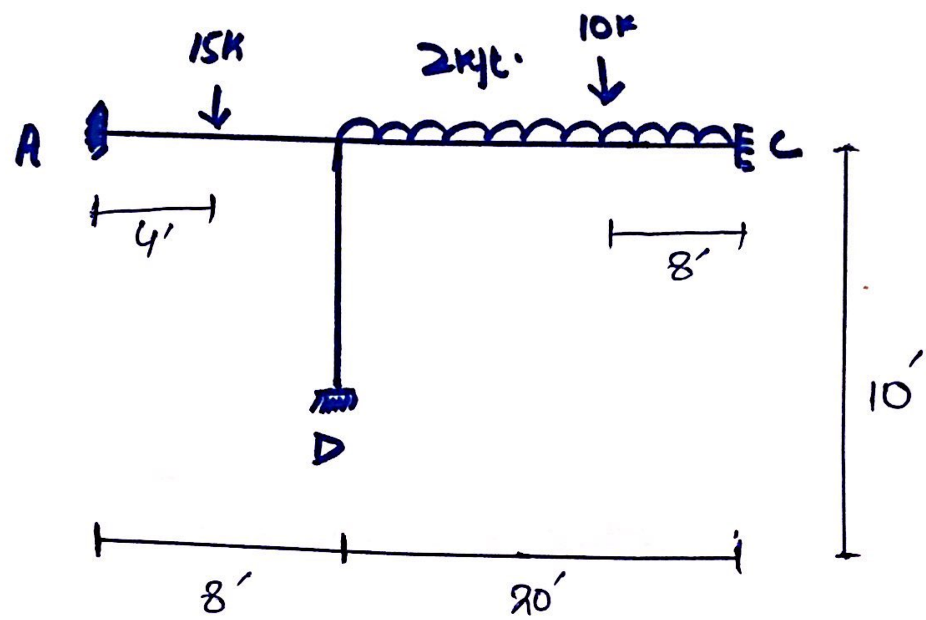
Now

$$\begin{bmatrix} AD1 - ADL1 \\ AD2 - ADL2 \end{bmatrix} = \begin{bmatrix} 0 - 16.04 \\ 4 - 6 \end{bmatrix} = \begin{bmatrix} 16.04 \\ -2 \end{bmatrix} \text{ ..E}$$

$$\begin{bmatrix} D_1 \\ D_2 \end{bmatrix} = \begin{bmatrix} 0.67 & -0.33 \\ -0.33 & 1.24 \end{bmatrix} \times \begin{bmatrix} -16.04 \\ -2 \end{bmatrix}$$

$$\begin{bmatrix} D1 \\ D2 \end{bmatrix} = \begin{bmatrix} -13.915 \\ 3.894 \end{bmatrix}$$ Answer 1.

QUISTION - 2



SOLUTION:-

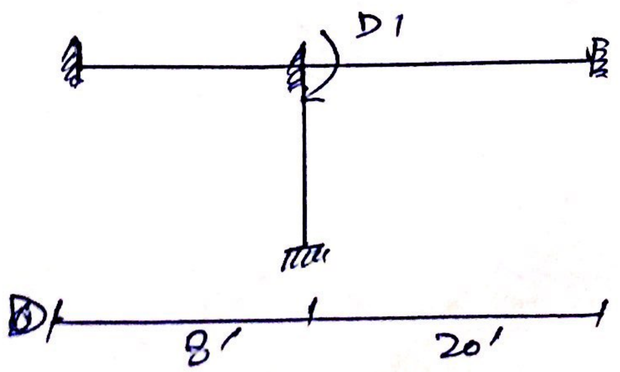
STEP 1:-

$KI = ?$

$KI = 1°$

STEP 2:-

Determine unkown joint displacement.

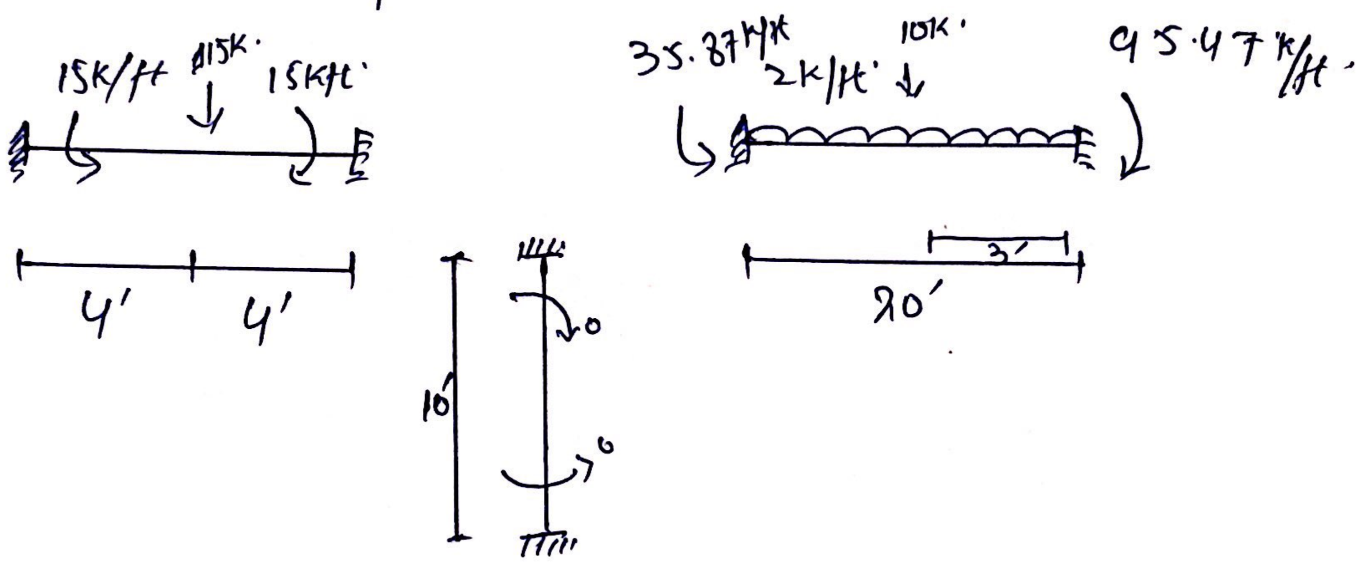


$[D] = [?]$

$[AD] = [0]$

Step 3:-

Compute ADL matrix.



Point load at center

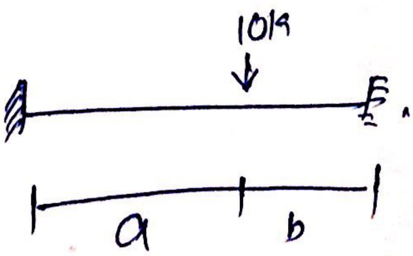
$$\frac{PL}{8} \Rightarrow \frac{(15)(8)}{8} = 15 \text{ K/ft}$$

Uniformly distributed load

$$\frac{wl^2}{12} \Rightarrow \frac{2(20)^2}{12} \Rightarrow 66.67 \text{ K/ft}$$

Point load (Not at mid)

Suppose.



For Left End

$$\frac{Pab^2}{L^2} = \frac{(10)(12)(8)^2}{(20)^2} = 19.2 \text{ K/ft.}$$

For Right End:

$$\frac{Pa^2b}{L^2} = \frac{(10)(12)^2(8)}{(20)^2} \Rightarrow 28.8 \text{ K/ft.}$$

total moment at Left End

$$19.2 + 66.67 = 85.87 \text{ K/ft.}$$

Similarly at right End

$$28.8 + 66.67 = 95.47 \text{ K/ft.}$$

So $[ADR] = -85.87 + 15 = -70.87$ K/ft.

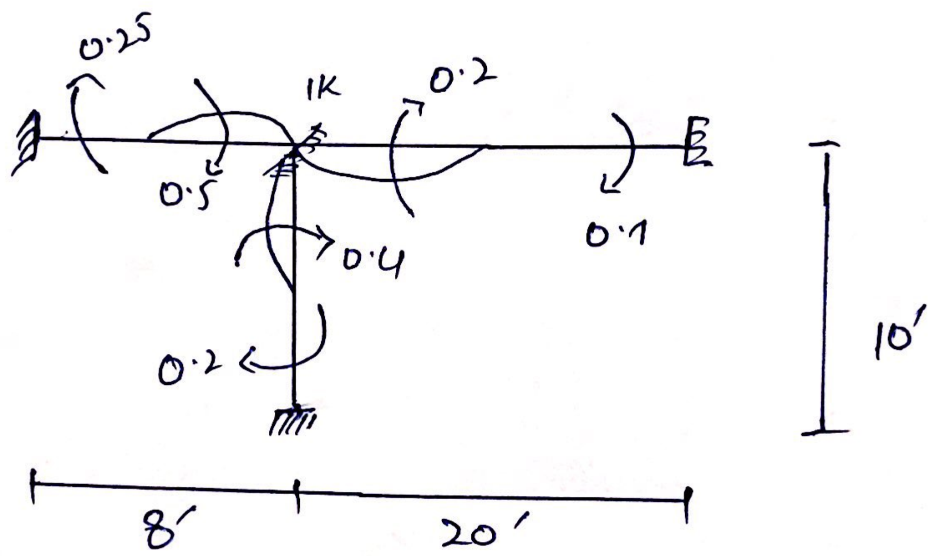
STEP 4:-

Determine [S] matrix.

$[S] = [S_{11}]$

Now

$D = 1K$.



$\frac{4EI}{8} = 0.5$ $\qquad$ $\frac{2EI}{8} = 0.25$

$\frac{4EI}{20} = 0.2$ $\qquad$ $\frac{2EI}{20} = 0.1$

$\frac{4EI}{10} = 0.4$ $\qquad$ $\frac{2EI}{10} = 0.2$.

$$[S] = (0.5 + 0.4 + 0.2)\ EI.$$

$$= 1.1\ EI$$

$$[S] = 1.1\ EI.$$

Step 5:-

Compute [D] matrix

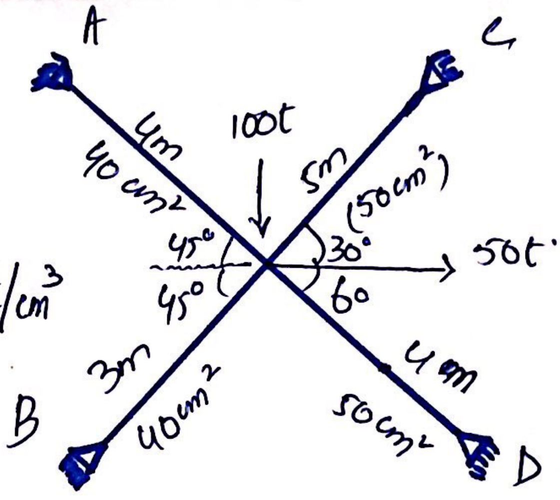
$$[D] = [S]^{-1} \times [AD] - [ADL]$$

$$D = \frac{1}{1.1} \times [0] - [-70.87]$$

$$= \frac{70.87}{1.1}$$

$$D = [64.42]\ 1/EI$$

QUISTION - 3



$E = 2000 \ t/cm^3$

SOLUTION::

FOR. A:-

$$\sin 45^\circ = \frac{p}{h} = \frac{p}{4}$$

$$p = 2.828 \ m.$$

$$\cos 45^\circ = \frac{b}{4}$$

$$b = 2.828 \ m$$

FOR B::

$$\sin 45^\circ = p/3$$

$$\cos 45^\circ = b/h$$

$$b = 2.12m$$

(12) (7)

FOR C:-

$$\sin 30^\circ = \frac{P}{h=5} \quad \therefore D = 2.5m.$$

$$\cos 30^\circ = b/5$$

$$= b = 4.33m.$$

Now

$EA(A) = 2000 \times 40 = 80{,}000\ t$

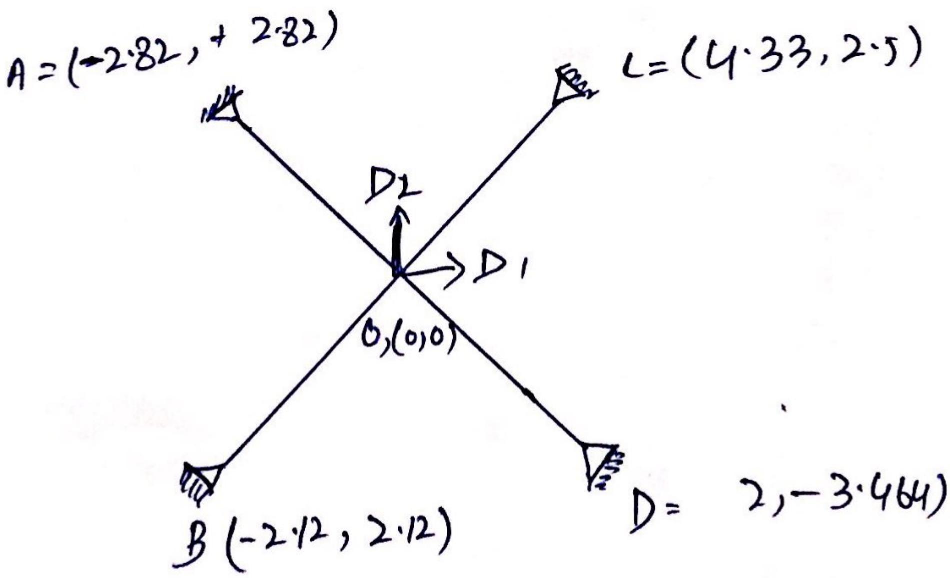
$EA(B) = 2000 \times 40 = 80{,}000\ t$

$EA(C) = 2000 \times 50 = 100{,}000\ t$

$EA(d) = 2000 \times 50 = 100{,}000\ t.$

STEP 1:-

Select Unknown Joint displacements.



$$\begin{bmatrix} D_1 \\ D_2 \end{bmatrix} = \begin{bmatrix} ? \\ ? \end{bmatrix}, \quad \begin{bmatrix} AD_1 \\ AD_2 \end{bmatrix} = \begin{bmatrix} 50 \\ -100 \end{bmatrix}$$

STEP 3:-

$[AMD]_{4\times2}$ & $[S]_{2\times2}$

(i) $D_1 = 1$, $D_2 = 0$

$$AMD_{11} = \frac{EA}{L^2}(x_k - x_j)$$

$$AMD_{11} = \frac{80{,}000}{(400)^2} \times (0 + 282) = 141$$

$$AMD_{21} = \frac{80{,}000}{300} \times (0 + 212) = 188.44$$

$$AMD_{31} = \frac{100{,}000}{(500)^2} \times 0 - 433 = \cancel{173} -173.2.$$

$$AMD_{41} = \frac{100{,}000}{(400)^2} \times (0 - 200) = -125$$

Now

$$S_{11} = \sum_{i=1}^{m} \frac{EA}{L^3}(x_k - x_j)^2.$$

$$\frac{80,000}{(400)^3} \times (2.82)^2 + \frac{80,00}{(300)^3} \times 212$$

$$+ \frac{100,000}{(500)^3} \times (-433) + \frac{100000}{(400)^3} - (200)^2$$

$$S_{11} = 99.405 + 1.33.107 + 149.991 + 82.5$$

$$\Rightarrow 445.063$$

$$S_{12} = S_{21} = \sum_{i=1}^{m} \frac{EA}{L^3} \times (X_k - X_j)(Y_k - Y_j)$$

$$= \frac{80,000}{(400)^3} \times (282)-282) + \frac{80,000}{(300)^3} \times 212 (2112)$$

$$+ \frac{100000}{(500)^3} \times (433(0-250) + \frac{100000}{(400)^3} \times (-200)(0+346)$$

$$S_{12} = S_{21} = 12.237.$$

(ii) $D_1 = 0$, $D_1 = 1K$.

$$AMD = \frac{EA}{L^2} (Y_K - Y_j)$$

$$AMD_{12} = \frac{80,000}{(300)^2} (-282 = -141$$

$$AMD_{22} = \frac{80,000}{(300)^2}(212) = 188.44$$

$$AMD_{32} = \frac{100,000}{(500)^2}(-250) = -100$$

$$AMD_{42} = \frac{100,000}{(400)^2}(346) = 216.25$$

Now $S_{22} \sum^{m} \frac{EA}{L^3}(Y_K - Y_j)^2$

$$\frac{80,000}{(400)^3}(282)^2 + \frac{80,000}{300^2}.(212)^2$$

$$+ \frac{100000}{(5000)^3}(-250)^2 + \frac{100000}{(400)^3}(346)^2$$

$S_{22} = 469.628$

STEP 4:-

$$[D] = [S]^{-1} \times [AD]$$

$$\begin{bmatrix} D_1 \\ D_2 \end{bmatrix} = \begin{bmatrix} 445.083 & 12.237 \\ 12.237 & 469.028 \end{bmatrix}^{-1} \times \begin{bmatrix} 50 \\ -100 \end{bmatrix}$$

$$\begin{bmatrix} D_1 \\ D_2 \end{bmatrix} = \begin{bmatrix} 0.1183 \\ -0.216 \end{bmatrix}$$

Step 5:-

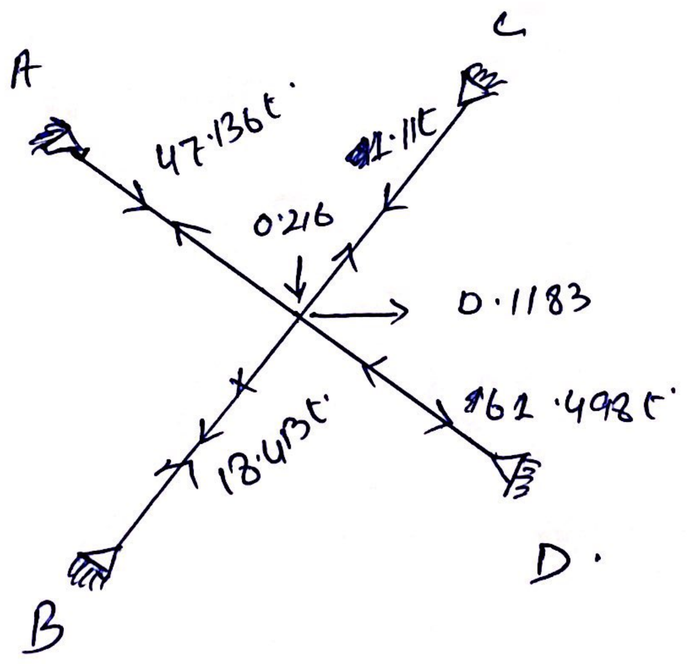
$[AM]$

$$\begin{bmatrix} AM_1 \\ AM_2 \\ AM_3 \\ AM_4 \end{bmatrix} = \begin{bmatrix} 141 & -141 \\ 188.4 & 188.44 \\ -173.2 & -100 \\ -125 & 216.25 \end{bmatrix} \times \begin{bmatrix} 0.1183 \\ -0.216 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 141 \times 0.1183 + (-141)(-0.216) \\ 188.44 \times 0.1183 + 188.44 \times (0.216 \\ -173.2 \times 0.1183 + (-100)(-0.216 \\ -125 \times 0.1183 + 216.25 \times 0.216 \end{bmatrix}$$

$$\begin{bmatrix} AM_1 \\ AM_2 \\ AM_3 \\ AM_4 \end{bmatrix} = \begin{bmatrix} 16.68 + 30.46 \\ 22.29 - 40.70 \\ -20.49 + 21.6 \\ -14.79 - 46.71 \end{bmatrix}$$

$$\begin{bmatrix} AM_1 \\ AM_2 \\ AM_3 \\ AM_4 \end{bmatrix} = \begin{bmatrix} 47.136t \\ -18.413t \\ 1.11\,t \\ -61.498t \end{bmatrix}$$



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