F → Flexi T → theory N → not mention.
M → mam
S →

16-17

1 (a) → theory
(b) → Flexi
2 (a) → T
(b) → F/N
3 (a) → F/N
(b) → F
4 (a) → S
5 (a) → M
(b) → M
6 (a) → M
(b) → M
7 (a) → M
(b) → S
8 (a) → S
(b) → S

15-16

1 (a) → M
(b) M
2 (a) S
(b) S
3 (a) S
(b) M
4 (a) M
(b) S
5 (a) F
(b) F
6 (a) F
(b) F
7 (a) F
(b) S
8 (a) N
(b) S

14-15

1 (a) F
(b) F
2 (a) F
(b) F
3 (a) S
(b) S
4 (a) S
(b) → T
5 (a) T
(b) M
6 (a) M
(b) M
7 (a) S
(b) F
8 (a) S
(b) S

13-14

1 (a) M
(b)
2 → F
3 → M
4 → F
5 → M
6 → F
7 → M
8 → S
9 → S
10 → S
11 → S
12 → S
13 → S
14 → F

12-13

1 (a) M
(b) S
2 (a) M
(b) S
3 (a) S
(b) S
4 (a) S
5 (a) F
(b) F/T
6 (a) F
(b) F
7 (a) F
(b) F
8 F.

11-12

1 (a) F
(b) S
2 (a) F
(b) S
3 (a) N
(b) S
4 → S
5 (a) M
(b) F
6 (a) Slope
(b) M
7 (a) M
8 (a) Slope
(b) —

S → 4
F → 4
M → 5

S → 5
F → 5
M → 4

13-14

S → 6
F → 5
M → 3

S → 6
F → 4
M → 4

S → 4
F → 6
M → 2

S → 4
F → 3
M → 3

11 12
10 11
8 9

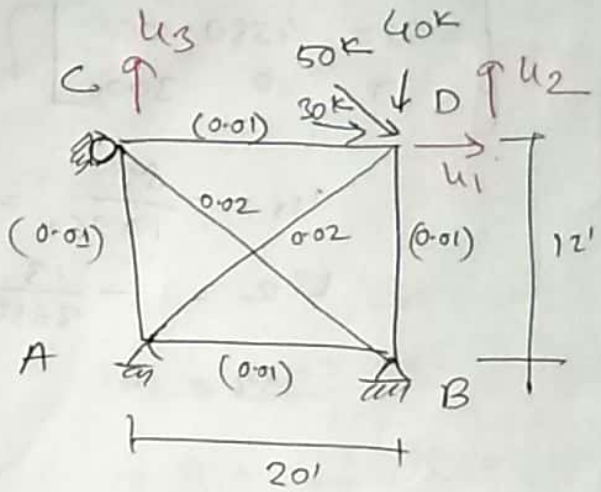
Nothing is certain.

2016-17
No. Ques.

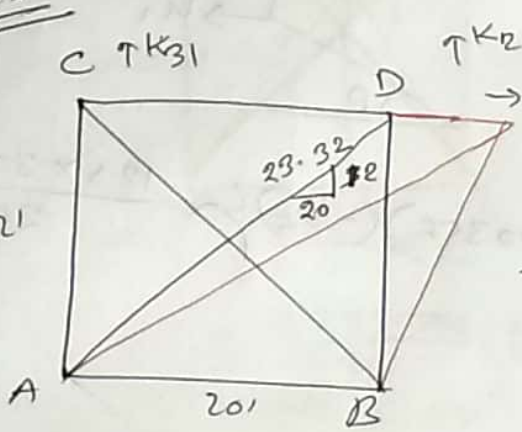
Truss

15-16
4 (b)

DOF = $4 \times 2 - (2+2+1)$
$= 3^\circ$



$U_1 = 1$



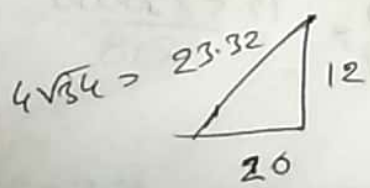
$K_{11} = \frac{0.01 \times E}{20} \cos^2 0^\circ$ → CD

$+ \frac{0.01 \times E}{12} \cos^2 90 +$ → BD

$+ \frac{0.02E}{23.32} \times \left(\frac{20}{23.32}\right)^2$ → AD

$= 0.001129E$

$= 4880.47$



$K_{21} = \frac{0.01E}{20} \cos 0 \sin 0$ → CD

$+ \frac{0.01E}{12} \cos 90 \sin 90$ → BD

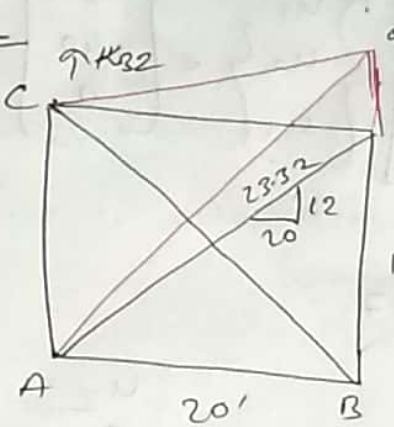
$+ \frac{0.02E}{23.32} \frac{20}{23.32} \times \frac{12}{23.32}$ → AD

$= 1635.08$

$$K_{31} = \frac{0.01E}{20} \times \cos\theta \sin\theta \rightarrow CD$$

$$= 0.$$

$u_2 = 1$



$$K_{12} = \frac{0.01E}{20} \cos\theta \sin\theta \rightarrow CD$$
$$+ \frac{0.01E}{12} \cos 90 \sin 90\,\theta \rightarrow BD$$
$$+ \frac{0.02E}{23.32} \times \frac{12}{23.32} \times \frac{20}{23.32} \rightarrow AD$$

$$= 1635.08$$

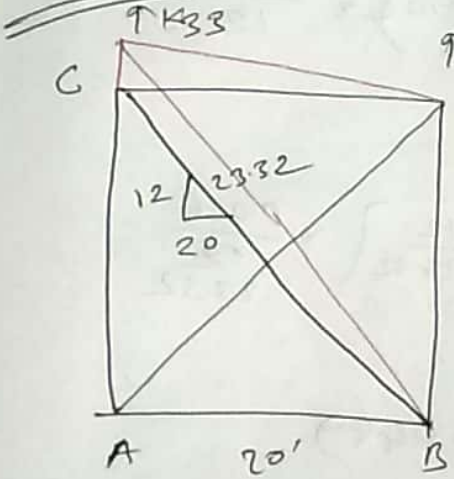
$$K_{22} = \frac{0.01E}{20} \sin^2\theta + \frac{0.01E}{12} \sin^2 90 + \frac{0.02E}{23.32} \left(\frac{12}{23.32}\right)^2$$

$\sin^2\theta \rightarrow CD$; $\sin^2 90 \rightarrow BD$; $\left(\frac{12}{23.32}\right)^2 \rightarrow AD$

$$= 4581.05$$

$$K_{32} = \frac{0.01E}{20} \sin^2\theta \rightarrow CD = 0.$$

$u_3 = 1$



$$K_{13} = \frac{0.01E}{20} \sin\theta \cos\theta \rightarrow CD$$
$$= 0$$

$$K_{23} = \frac{0.01E}{20} \sin^2\theta$$

$$= 0.$$

$$K_{33} = \frac{0.01E}{20} \sin^2\theta + \frac{0.01E}{12} \sin^2 90$$
$$+ \frac{0.02E}{23.32} \left(\frac{12}{23.32}\right)^2$$

$$= 4581.05$$

$P_{mt} + Ku = P_j$

$\hookrightarrow 0$

$$\begin{bmatrix} 4880.47 & 1653.08 & 0 \\ 1653.08 & 4581.05 & 0 \\ 0 & 0 & 4581.05 \end{bmatrix} \begin{Bmatrix} u_1 \\ u_2 \\ u_3 \end{Bmatrix} = \begin{bmatrix} 30 \\ -40 \\ 0 \end{bmatrix}$$

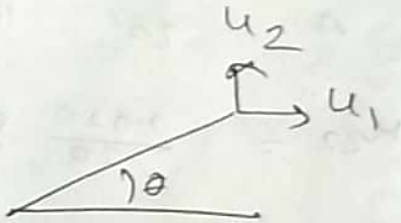
$u_1 = 0.01037$

$u_2 = -0.01247$

$u_3 = 0$

Bar force

$= (u_1 \cos\theta + u_2 \sin\theta) \frac{AE}{L}$



$F_{AB} = (0.01037 \times \cos 0 + (-0.01247) \times \sin 0) \frac{0.01 \times E}{20}$

$= 22.39 K$

$F_{AC} = \{0.01037 \times \cos 90 + (-0.01247) \times \sin 90\} \times \frac{0.01 \times E}{12}$

$= -44.89 K$

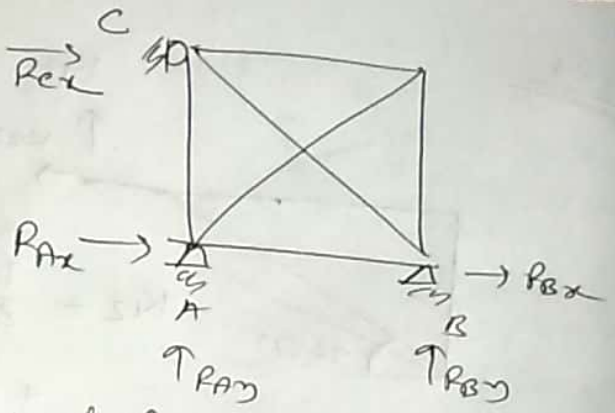
$F_{AD} = \left[0.01037 \times \frac{20}{23.32} + (-0.01247) \times \frac{12}{23.32}\right] \times \frac{0.02E}{23.32}$

$= 9.175$

$F_{BD} =$ ~~$0.01037 \times \cos 90 +$~~ $F_{AC} = -44.89$

$F_{DC} = F_{AB} = 22.39$

$F_{BC} = 56.71 K$



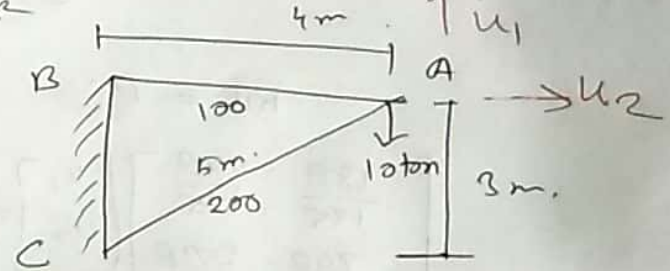
(R)

~~R_{Ax} =~~

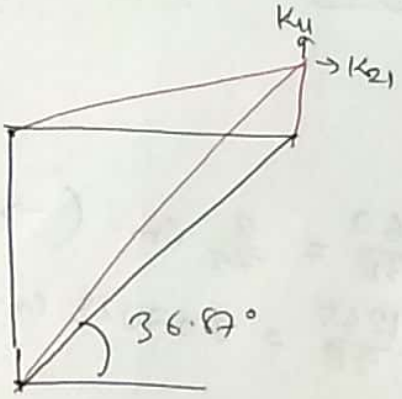
See from ~~Hamim's cloth~~ my desire. hamim's clothes.

14-15

4 (a) $E = 2000 \text{ ton/cm}^2$



$u_1 = 1$



$$K_{11} = \frac{100E}{400} \sin^2 0 + \frac{200E}{500} \sin^2(36.87)$$

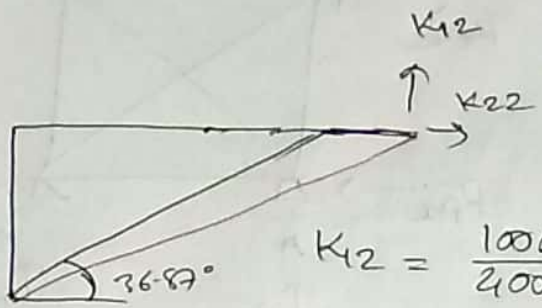
length cm এককে নিয়ে 2টি

$$= \frac{18E}{125}$$

$$K_{21} = \frac{100E}{400} \sin 0 \cos 0 + \frac{200E}{500} \cos(36.87) \cdot \sin(36.87)$$

$$= \frac{24E}{125}$$

$u_2 = 1$



$$K_{12} = \frac{100E}{400} \sin 0 \cos 0 + \frac{200E}{500} \sin 36.87 \cos 36.87$$

$$= \frac{24E}{125}$$

$$K_{22} = \frac{100E}{400} (\cos 0)^2 + \frac{200E}{500} (\cos 36.87)^2$$

$$= \frac{253}{500} E$$

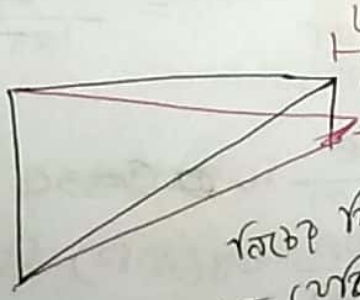
$$KU = P_j$$

$$\begin{bmatrix} \frac{18E}{125} & \frac{24E}{125} \\ \frac{24E}{125} & \frac{253E}{500} \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix} = \begin{bmatrix} -10 \\ 0 \end{bmatrix}$$

$$u_1 = -\frac{1265}{9E}$$

$$u_2 = \frac{160}{3E}$$

Displacement of A

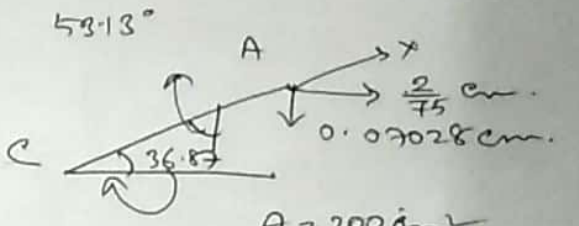


$$\frac{160}{3E} = \frac{2}{75} \text{ cm.} \ (\rightarrow)$$

$$\frac{1265}{9E} = 0.07028 \text{ cm} \ (\downarrow)$$

বিভেদ দিকে
সমান বোঝাতে
u_1 এর দিকে
ধরা হয়েছে
actually
value

Bar forces



$A = 200\ cm^2$

$E = 2000\ ton/cm^2$

$L = 500\ cm.$

$\Sigma F_x = 0$

$$\Rightarrow F_{AC} = \frac{2}{75} \times \frac{AE}{L} \cos 36.87 - 0.07028 \times \frac{AE}{L} \cos(53.13)$$

$$= -16.67\ ton\ (comp).$$

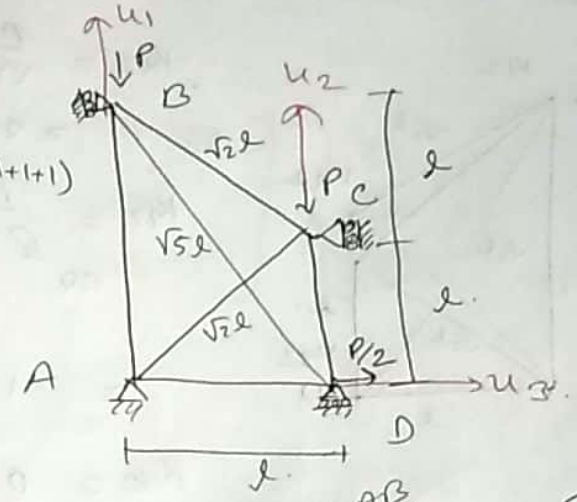
$$F_{AB} = \frac{2}{75} \frac{AE}{L} \cos 0$$

$$= 13.33\ ton\ (tension)$$

Truss Problem

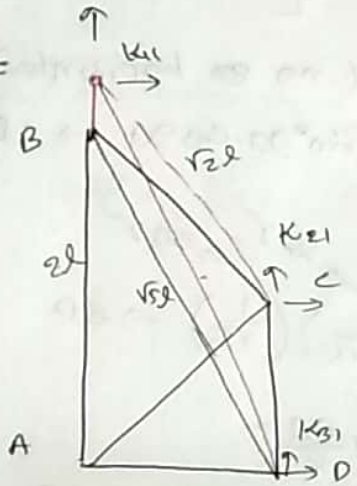
2013-14

(10)



$$DOF = 4\times2 - (2+1+1+1) = 3^0$$

$u_1 = 1$



$$K_{11} = \underbrace{\frac{AE}{2\ell}\sin^2 90^\circ}_{\to AB} + \underbrace{\frac{AE}{\sqrt{5}\ell}\left(\frac{2}{\sqrt{5}}\right)^2}_{\to BD,\ \sin^{-1}\left(\frac{2}{\sqrt{5}}\right)} + \underbrace{\frac{AE}{\sqrt{2}\ell}\left(\frac{1}{\sqrt{2}}\right)^2}_{\to BC}$$

$$= 1.2113\frac{AE}{\ell}$$

$$K_{21} = \frac{AE}{\sqrt{2}\ell}\left(\frac{1}{\sqrt{2}}\right)^2 \to BC \quad (\sin\gamma)$$

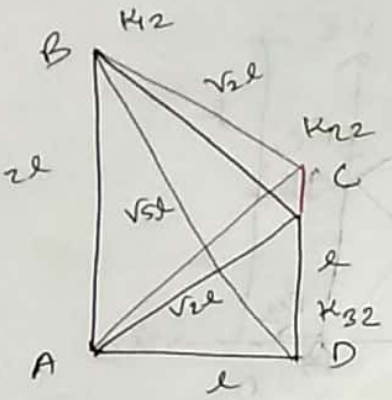
$$= 0.3536\frac{AE}{\ell}$$

$$K_{31} = -\frac{AE}{\sqrt{5}\ell}\left(\frac{2}{\sqrt{5}}\right)\left(-\frac{1}{\sqrt{5}}\right) \to BD$$

$\sin\gamma$	$\cos\gamma$

$$= 0.1789\frac{AE}{L}$$

$u_2 = 1$



$K_{12} = \frac{AE}{\sqrt{2}\ell}\left(-\frac{1}{\sqrt{2}}\right)^2 \rightarrow BC$ (→ sin r)

$= 0.3536\ \frac{AE}{L}$

$K_{22} = \frac{AE}{\ell} + \frac{AE}{\sqrt{2}\ell}\left(\frac{1}{\sqrt{2}}\right)^2 \rightarrow AC$ (CD)

$+ \frac{AE}{\sqrt{2}\ell}\left(-\frac{1}{\sqrt{2}}\right)^2 \rightarrow BC$

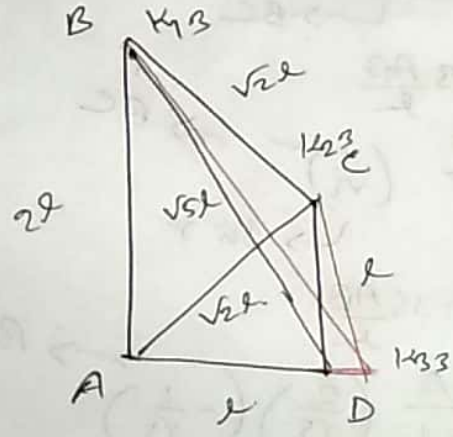
$= 1.7071\ \frac{AE}{L}$

$K_{32} = 0$ (no horizontal)

$= \frac{AE}{\ell} \sin^2 90 \cdot \cos 90 \cdot \rightarrow CD$

$= 0.$

$u_3 = 1$



$K_{13} = \frac{AE}{\sqrt{5}\ell}\left(-\frac{2}{\sqrt{5}}\right)\left(\frac{1}{\sqrt{5}}\right) \rightarrow BD$ (→ sin r, → cos r)

$= 0.1789\ \frac{AE}{L}$

$K_{23} = \frac{AE}{\ell} \sin 90 \cos 90 \rightarrow CD$

$= 0.$

$K_{33} = \frac{AE}{L}$ (→ AD) $+ \frac{AE}{\sqrt{5}\ell}\left(\frac{1}{\sqrt{5}}\right)^2$ (→ BD, cos r)

$+ \frac{AE}{\ell}(\cos 90)^2$ (→ CD)

$= 1.8894\ \frac{AE}{L}$

যেখানে তরঙ্গের দিকে
যেখানে তরঙ্গের Axial force.

$P_m + K_u = P_j$

↳ 0 for forces.

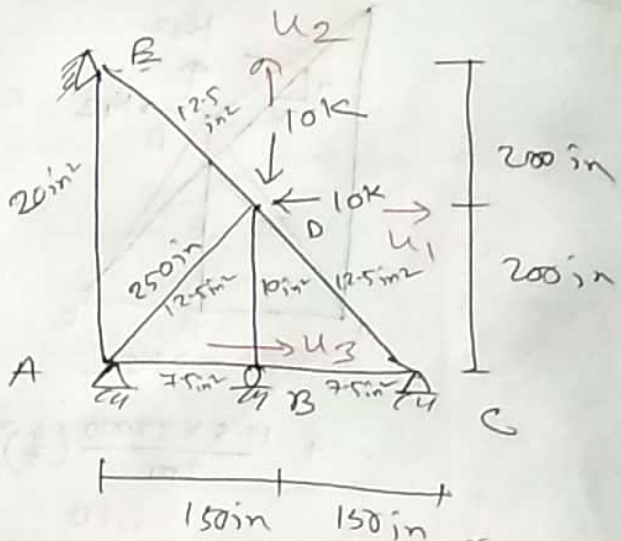
$$\frac{AE}{L}\begin{bmatrix} 1.2113 & 0.3536 & 0.1789 \\ 0.3536 & 1.7071 & 0 \\ 0.1789 & 0 & 1.0894 \end{bmatrix} \begin{Bmatrix} u_1 \\ u_2 \\ u_3 \end{Bmatrix} = \begin{bmatrix} -P \\ -P \\ P/2 \end{bmatrix}$$

2012+13

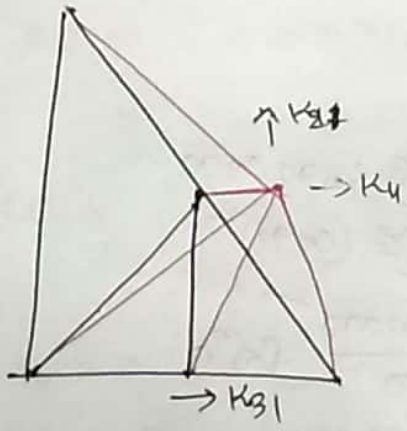
3 (b) $E = 30000\ K_{ip}$

DOF = $5 \times 2 - (2+2+2+1)$

$= 3$



$u_1 = 1$



$$K_{11} = \frac{12.5 \times 30000}{250} \times \left(\frac{3}{5}\right)^2 + 0 \quad (\rightarrow \cos\gamma,\ \rightarrow BD)$$

$$+ \frac{12.5 \times 30000}{250} \times \left(\frac{3}{5}\right)^2 + \frac{12.5 \times 30000}{250} \times \left(\frac{3}{5}\right)^2$$

↳ AD ↳ CD

$= 1620$

$$K_{21} = \frac{12.5 \times 30000}{250} \times \left(\frac{3}{5}\right)\left(-\frac{4}{5}\right) + \frac{12.5 \times 30000}{250} \left(-\frac{3}{5}\right)\left(\frac{4}{5}\right)$$

$= -720.$

$K_{21} = \frac{12.5 \times 30000}{250} \times \frac{3}{5} \times (-4/5)$ (→ ~~BD~~ DE) $+ \frac{12.5 \times 30000}{250}(3/5)(4/5)$ (→ AD)

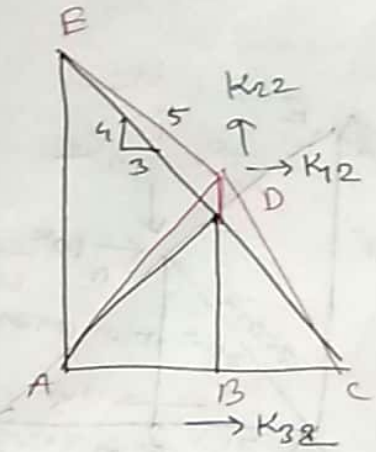
$+ 0 + \frac{12.5 \times 30000}{250}(-3/5)(4/5)$

↳ BD ↳ CD

$= -720$

$K_{31} = 0.$

$u_2 = 1$



$K_{12} = \frac{12.5 \times 30000}{250} \times (3/5)(-4/5)$ (→ ED)

$+ 0 + \frac{12.5 \times 30000}{250}(3/5)(4/5)$ (→ AD)

$+ \frac{12.5 \times 30000}{250}(-3/5)(4/5)$ (BD ↵, ↳ CD)

$= -720.$

$K_{22} = \frac{10 \times 30000}{200}$ (→ BD)

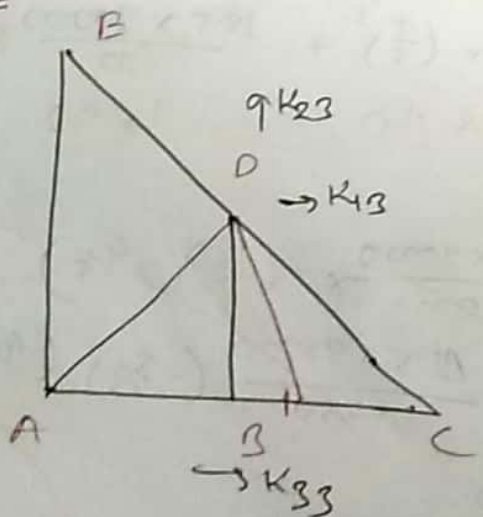
$+ \frac{12.5 \times 30000}{250}(4/5)^2 + \frac{12.5 \times 30000}{250}(4/5)^2 + \frac{12.5 \times 30000}{250}(-4/5)^2$

↳ AD ↳ CD ↳ ED

$= 4380.$

$K_{32} = 0.$

$u_3 = 1$



$K_{13} = 0 = \frac{AE}{L} \sin 90 \cos 90.$

$K_{23} = 0 = \frac{AE}{L} (\cos 90)^2.$

$K_{33} = \frac{7.5 \times 30000}{150} \sin^2 0$ (→ AB)

$+ \frac{7.5 \times 30000}{150} \cos^2 0$ ↳ CB

$= 3000$

$P_m + K u = P_j$

$u_3 = 0$

$$\Rightarrow \begin{bmatrix} 1620 & -720 & 0 \\ -720 & 4380 & 0 \\ 0 & 0 & 3000 \end{bmatrix} \begin{Bmatrix} u_1 \\ u_2 \\ u_3 \end{Bmatrix} = \begin{bmatrix} -10 \\ -10 \\ 0 \end{bmatrix}$$

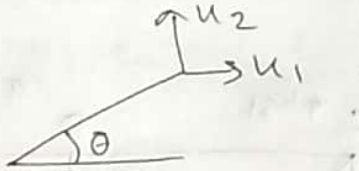
$$u_1 = -\frac{85}{10962} = -0.00775$$

$$u_2 = -\frac{13}{3654} = -0.00356$$

$$u_3 = 0$$

Bar forces

$$= (u_1 C_s\theta + u_2 S_n\theta)\frac{AE}{L}$$



$$F_{ED} = \{(-0.00775)(3/5) + (-0.00356)(-4/5)\} \times \frac{12.5 \times 30000}{250}$$

$$= -2.703\,K \leftarrow$$

$$F_{EA} = 0$$

$$F_{AD} = \{(-0.00775) \times \frac{3}{5} + (-0.00356)\frac{4}{5}\} \times \frac{12.5 \times 30000}{250}$$

$$= -11.247\,K.$$

$$F_{CD} = \{(-0.00775) \times (-3/5) + (-0.00356) \times \frac{4}{5}\} \times \frac{12.5 \times 30000}{250}$$

$$= 2.703\,K$$

$$F_{AB} = 0$$

$$F_{CB} = 0$$

$$F_{BD} = \{(-0.00775) \times 0 + (-0.00356) \times 1\} \times \frac{10 \times 30000}{200}$$

$$= -5.34\,K$$