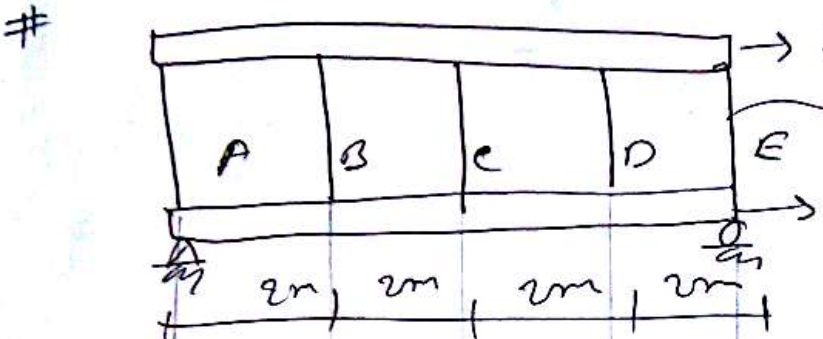
Need to learn these first fast ☺

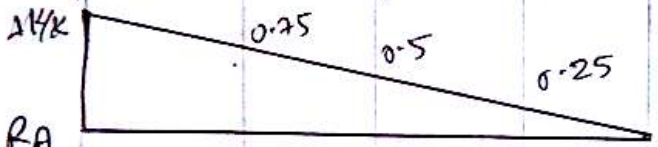
Influence Line for floor beam:

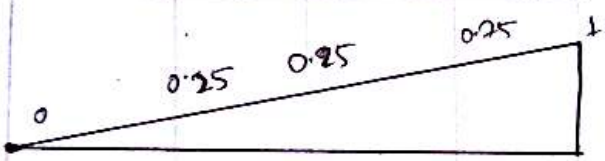


→ Floor
→ floor beam
→ Girder.

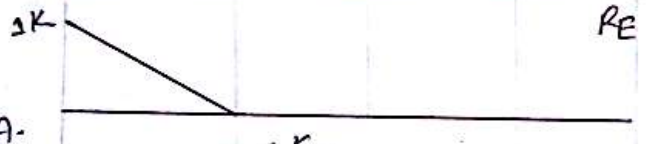
$\Sigma M_A = 0 \cdot 2$

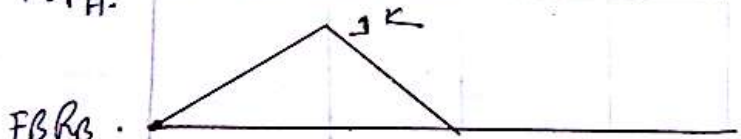
$R_E = \frac{1}{8}$





	A	B	C	D	E
FBR_A	1	0	0	0	0
FBR_B	0	1	0	0	0
FBR_C	0	0	1	0	0
FBR_D	0	0	0	1	0
FBR_E	0	0	0	0	1





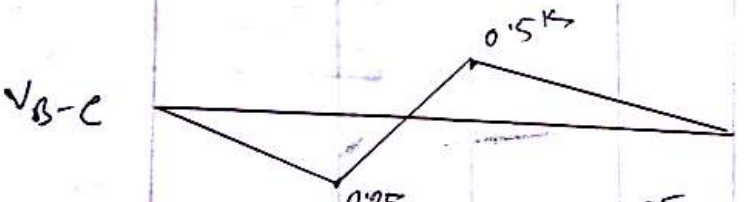
For Shear V_{2-3}.

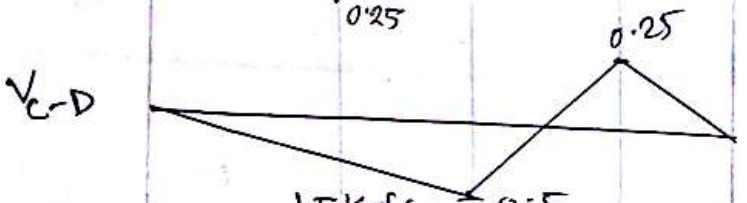
F_{BRA} ↓ F_{BRB} ↓ → ↓ V_{B-C}

↑ R_A (left)

$V_{BC} = R_A - F_{BRA} - F_{BRB}$.

$V_{CD} = R_A - F_{BRA} - F_{BRB} - F_{BRC}$

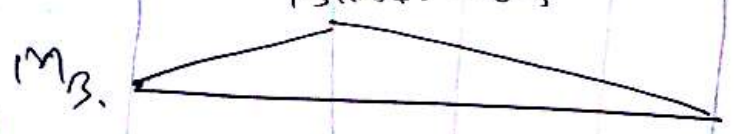




For Moment:

↓ F_{BRA} ↓ F_{BRB}.

↑ R_A ↻ M.

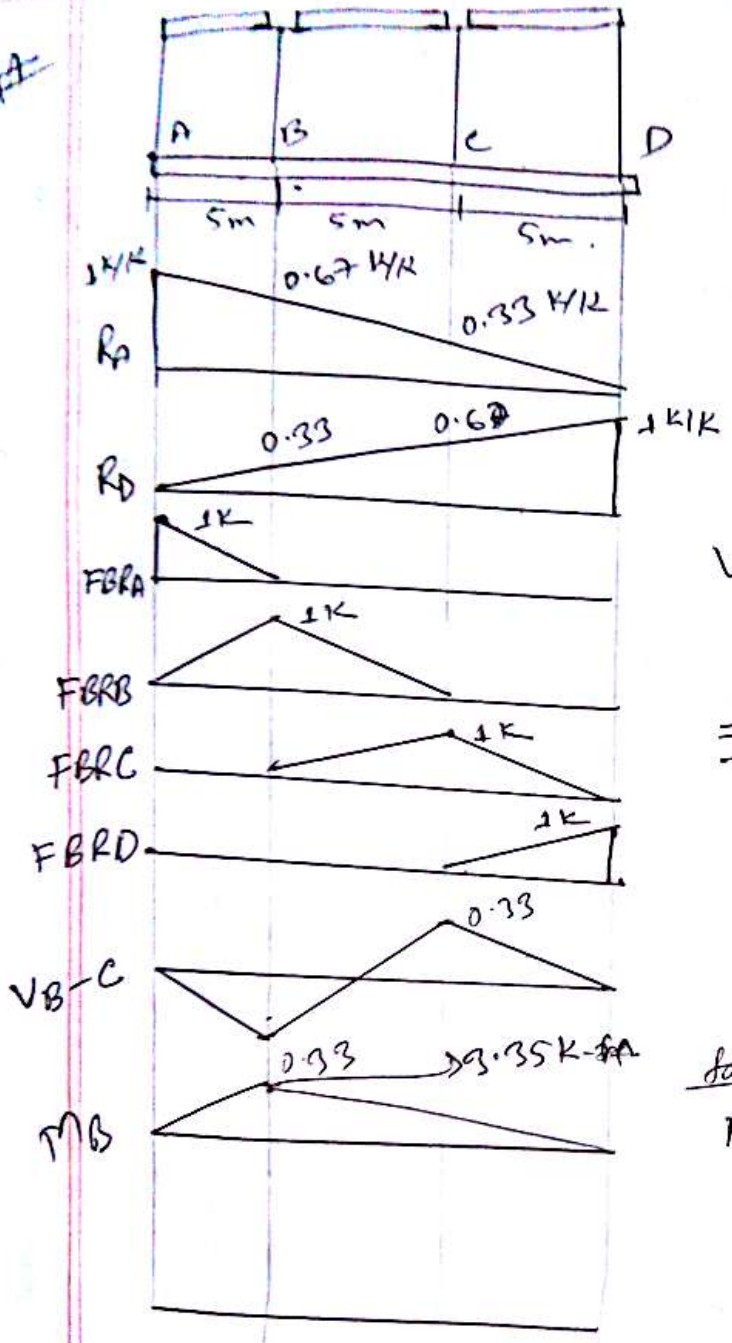


$\Sigma M_B = 0$ ↻

$M_B = (R_A - F_{BRA}) \times 2$

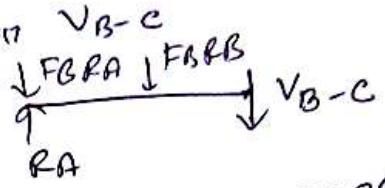
=

#4



	A	B	C	D.
FBRA	1	0	0	0
FBRB	0	1	0	0
FBRC	0	0	1	0
FBRD	0	0	0	1

for V_{B-C}

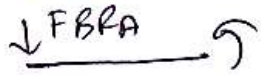


$V_{B-C} = R_A - F_{BRA} - F_{BRB}$.

$0.67 - 1 = -0.33$

FOR M_B

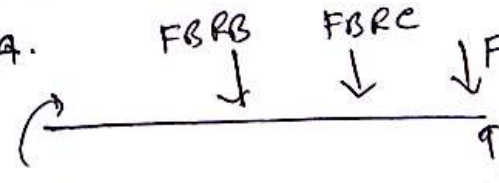
Take a section at B (left)



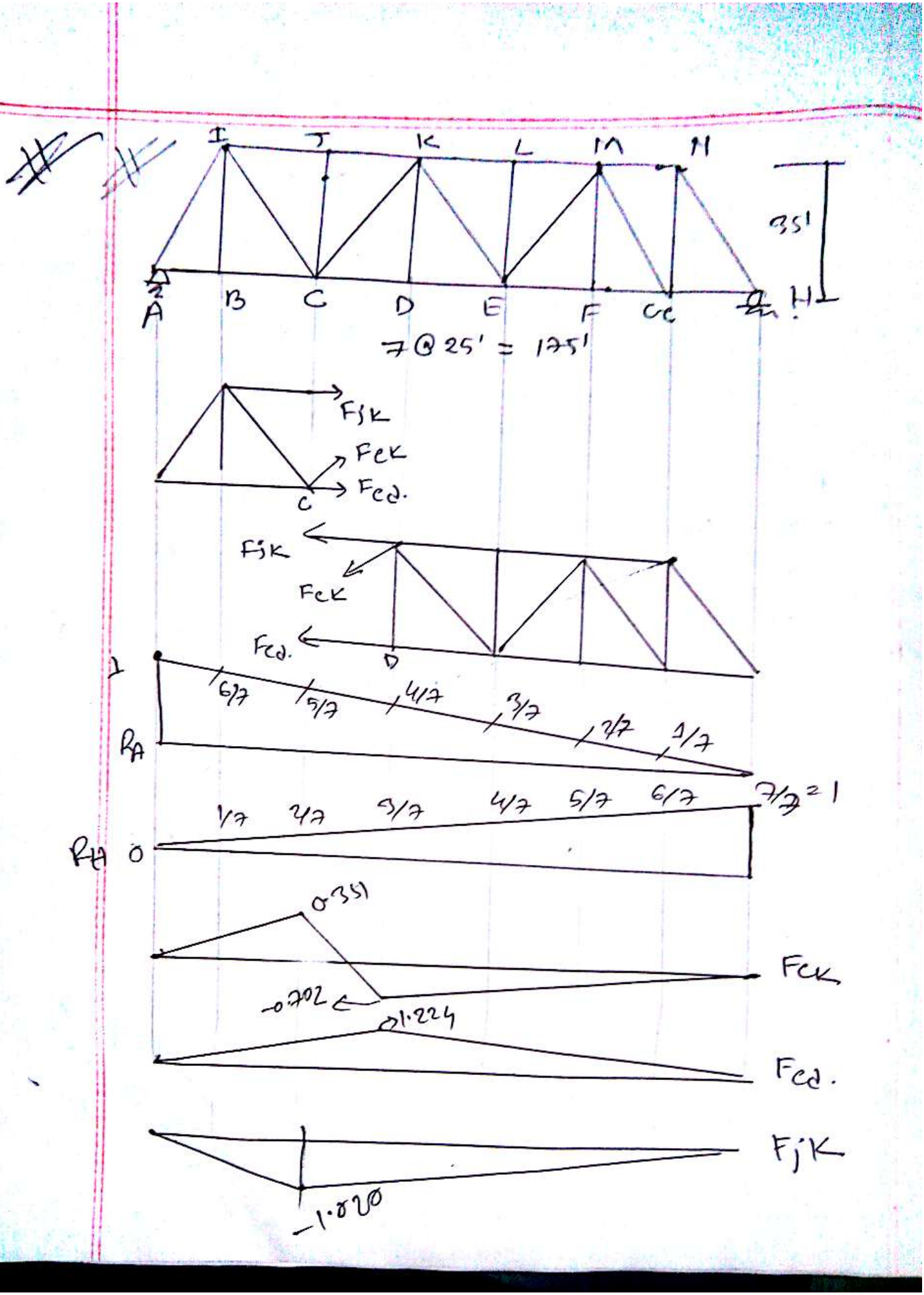
$M_B = (R_A - F_{BRA}) \times 5$ (distance)

$0.67 \times 5 = 3.35$

for M_A



$M_A = -F_{BRB} \times 5 - F_{BRC} \times 10 - F_{BRD} \times 15 + R_D \times 15$



$\Rightarrow M_A = 0$ ↺

$\Rightarrow a \times 1 - R_H \times 175 = 0$

$\Rightarrow R_H = \frac{a}{175}$

$\Sigma F_y = 0$ ↑ +

$\Rightarrow -1 + \frac{a}{175} + R_A = 0$

$\Rightarrow R_A = 1 - \frac{a}{175}$

left part

$\Sigma M_e = 0$ ↺

$\Rightarrow F_{JK} \times 35 + R_A \times 50 - 1 \times c = 0$

$\Rightarrow F_{JK} = \frac{c - 50 R_A}{35}$ [A-C]

$F_{JK} = -\frac{50 R_A}{35}$ [C-H]

$\Sigma F_y = 0$ ↑

$\Rightarrow R_A - 1 + F_{CK} \times \frac{35}{\sqrt{25^2+35^2}} = 0$

$\Rightarrow F_{CK} = \frac{(1 - R_A) \times \sqrt{25^2+35^2}}{35}$

[A-C]

$F_{CK} = -R_A \times \frac{\sqrt{25^2+35^2}}{35}$

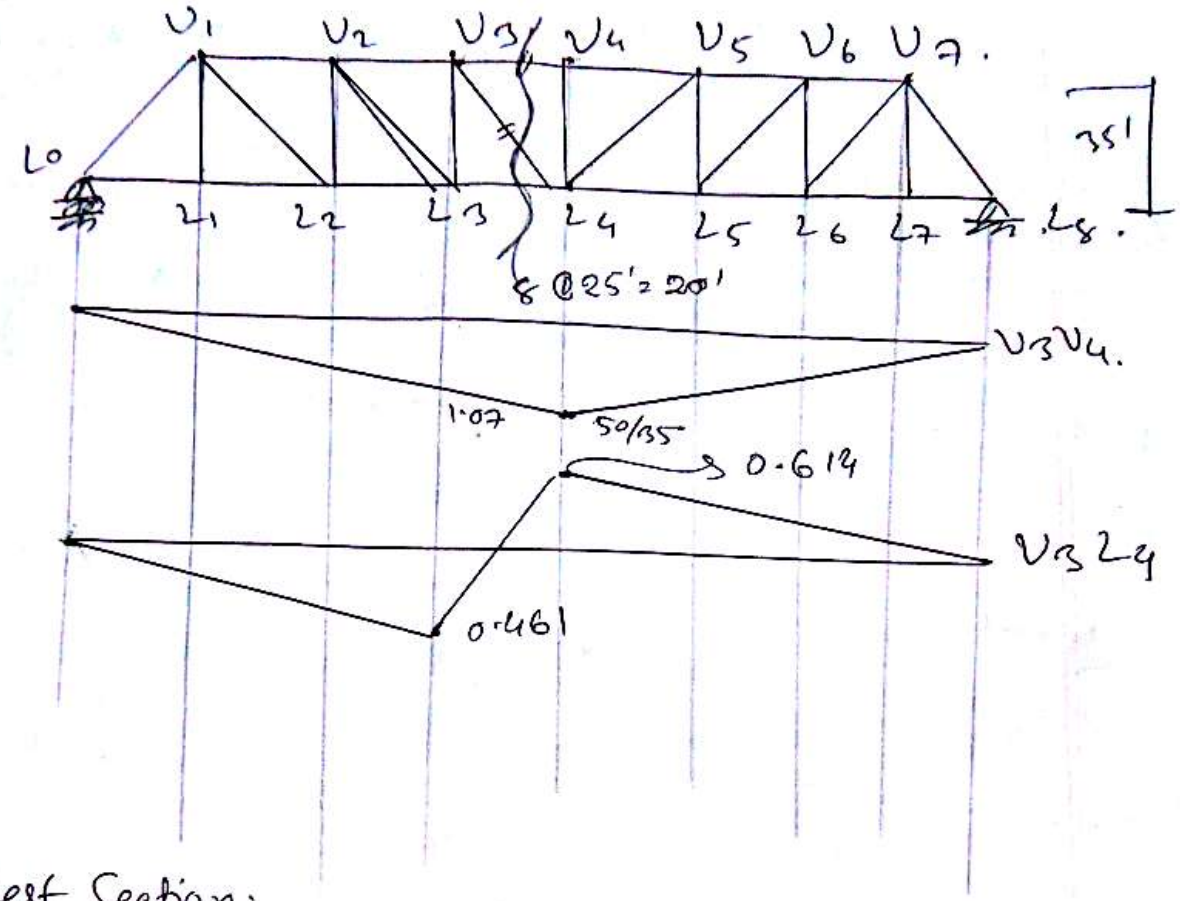
[C-H]

$\Sigma F_x = 0$

$F_{ED} + F_{JK} + \frac{F_{CK} \times 25}{\sqrt{25^2+35^2}} = 0$

$\Rightarrow F_{ED} = -F_{JK} - \frac{F_{CK} \times 25}{\sqrt{25^2+35^2}}$

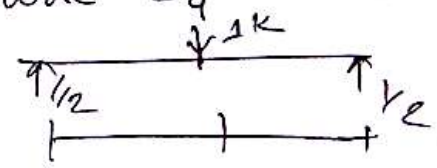
$U_3U_4 = ?$
$U_3L_4 = ?$ $L_3L_4 = ?$



Left Section:

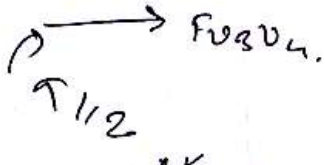
$M_{L_4} = 0$.

1K at L_4.

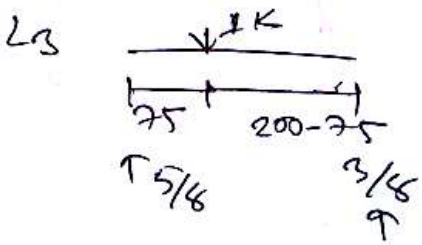


$\frac{1}{2} \times 100 + F_{U_3U_4} \times 35 = 0$.

$\Rightarrow F_{U_3U_4} = -\frac{50}{35}$ K/e. (C)



Load 1K at L_3.

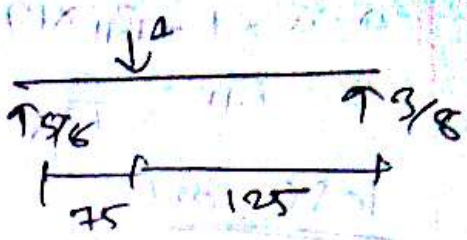


$\frac{5}{8} \times 100 - 1 \times 25 + F_{U_3U_4} \times 35 = 0$

$\Rightarrow F_{U_3U_4} = -1.07$ (C)

For U_3L_4 load U_3 and L_4 point

1 kN at L_3.



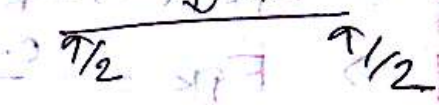
$\frac{5}{8} \cdot -1 + (F_{U_3L_4})\, V = 0.$

$\Rightarrow V.(F_{U_3L_4}) = \frac{3}{8}$ (T)

$\Rightarrow \frac{35}{\sqrt{25^2+35^2}} \cdot F_{U_3L_4} = \frac{3}{8}$

$\Rightarrow F_{U_3L_4} = 0.461$

Load at L_4.



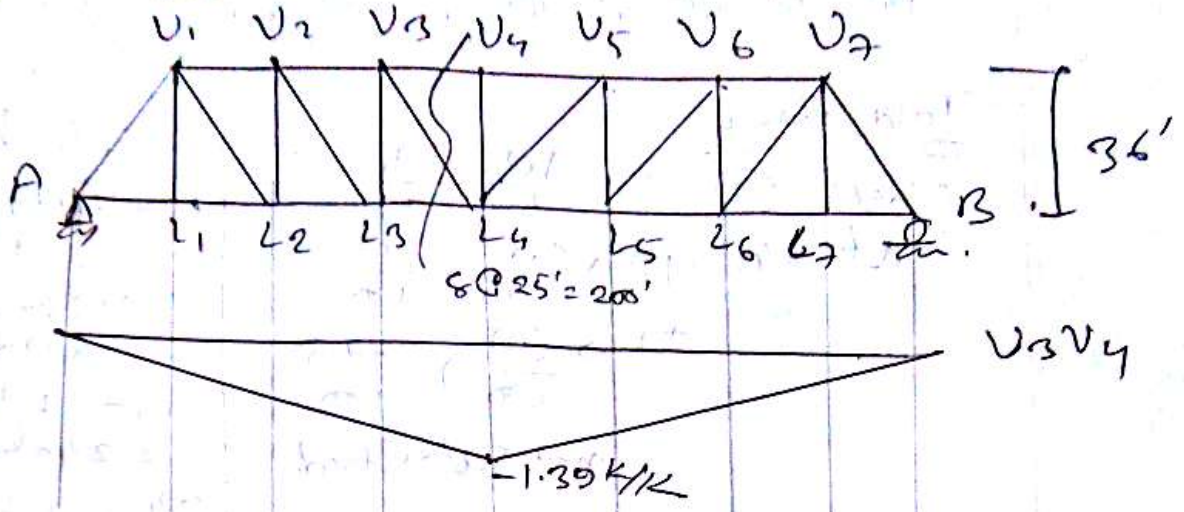
$1/2 - 1 + (F_{U_3L_4})\, V = 0.$

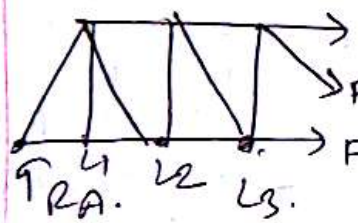
$\Rightarrow F_{U_3L_4} \frac{35}{\sqrt{25^2+35^2}} = \frac{1}{2}$

$\Rightarrow 0.614$

Assignment;

at U_3U_4 = ?





$\Sigma F_y = 0$ → load at L_1, $R_A = 7/8$

$$-\frac{F' \times 36}{\sqrt{25^2+36^2}} - 1 + \frac{7}{8} = 0$$

$$\Rightarrow F' = \frac{(7/8 - 1) \times \sqrt{36^2+25^2}}{36} = -0.15$$

$\Sigma M_{L3} = 0$ → load at L_4

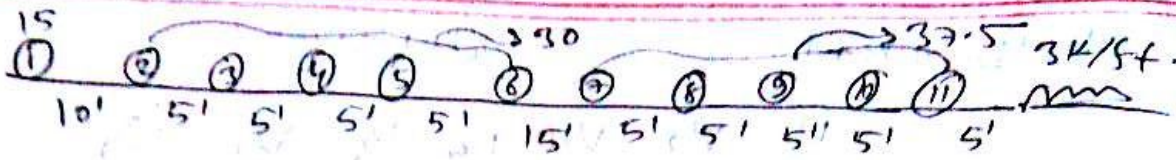
$$\Rightarrow F \times 36 = 1 \times 50 + \frac{7}{8} \times 75 + \frac{F' \times 25}{\sqrt{36^2+25^2}} \times 36 = 0$$

$$\Rightarrow F = 1 \times 50 - \frac{7 \times 75}{8} - 36 \times \frac{F' \times 25}{\sqrt{36^2+25^2}}$$

$$\frac{36.}{36.} = -0.35 K$$

	F'	F
L_1	-0.15	-0.35
L_2	-0.30	-0.70
L_3	-0.45	-1.04
L_4	0.61	-1.39
L_5	0.46	-1.04
L_6	0.3	-0.70
L_7	0.15	-0.35

Left total
Right → on the position
wheel are
reverse



Trial No-1

Wheel ⑨ at L4. $\frac{W}{L}$, $\frac{W_1}{a}$

JR → $\frac{607.5}{200}$, $\frac{240}{100}$.

JL → $\frac{607}{200}$, $\frac{277.5}{100}$.

not satisfied

Calculation

W = ① to ⑪ +85' VD2

= 352.5 + 85 × 3

= 607.5K

W_1 = 1 to 8.

= 240K

W_1 = 1 to 9

= 277.5K

Wheel 10 at L4. JR → $\frac{622.5}{200}$, $\frac{277.5}{100}$

JL → $\frac{622.5}{200}$, $\frac{315}{100}$.

Satisfied.

W = 1-11 + 90' of VD2

= 352.5 + 90 × 3

= 622.5

W_1 = 1-9

= 277.5

W_1 = ① - ⑩

= 315K

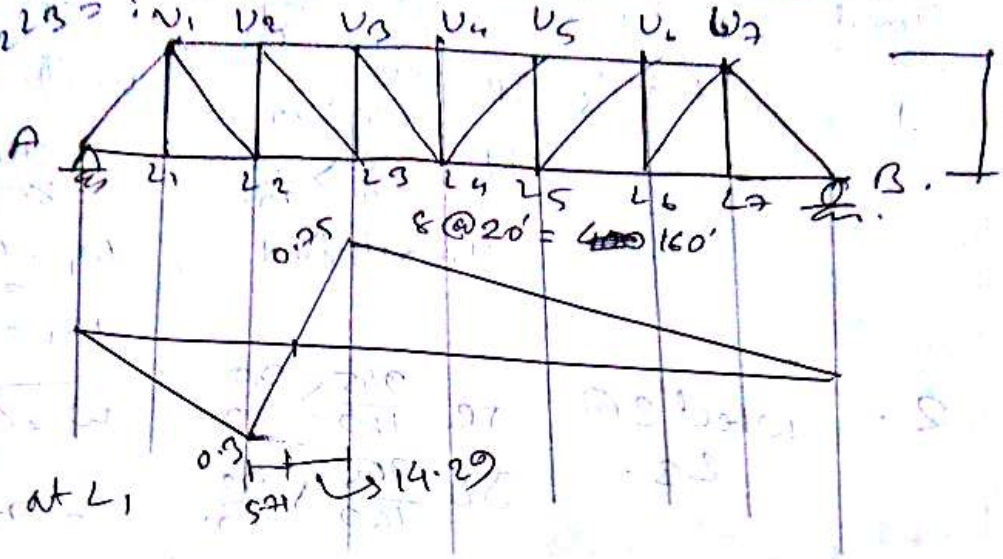
Maximum stresses

$= \frac{1.39}{100} \times 37.5 (100+95) + \frac{1}{2} \times 90^2 \times \frac{1.39}{100} \times 3$

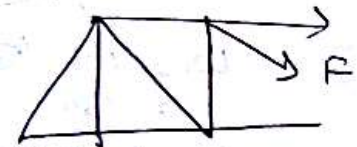
$+ \frac{1.39}{100} [15 \times 40 + 30 \times (50+55+60+65+70) + 37.5 \times (85+90+95)]$

$= 542.17K$ (Compression)

At L_2L_3 = ?



Load at L_1



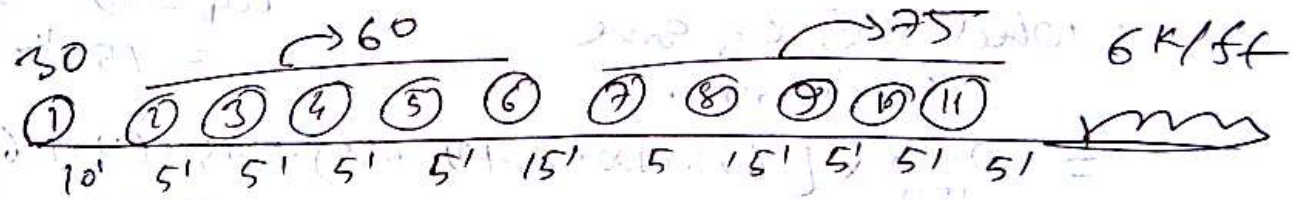
$\Sigma F_y = 0$

$\Rightarrow \frac{-F \times 30}{\sqrt{30^2+20^2}} + \frac{7}{8} - 1 = 0$

$\Rightarrow F = \frac{(7/8 - 1) \times \sqrt{30^2+20^2}}{30} = -0.15$

~~Centerline~~ $= \frac{(R_A - 1) \times \sqrt{30^2+20^2}}{30}$

	A	L_1	L_2	L_3	L_4	L_5	L_6	L_7
F =	0	-0.15	-0.3	~~-0.45~~ 0.25	0.6	0.45	0.3	0.15	0



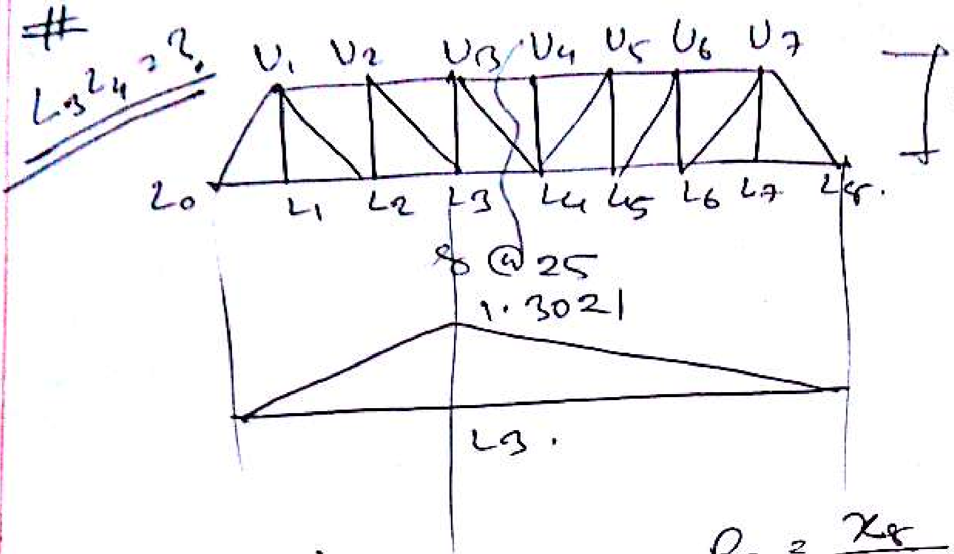
Trial	position.	$\frac{W}{L}$	$\frac{W_1}{P}$	calculation.
1	1 @ L3	JR $\frac{885}{160} > \frac{0}{20}$		$W = ① - ⑪ + 30'$ VDL
		JL $\frac{885}{160} > \frac{30}{20}$		$= 705 + 180$
		Not satisfied		$= 885$ K
				$W_1 =$ ~~wheel ①~~
				$= 0$.
				$W_1 =$ wheel ① $= 30$K
2.	wheel 2 @ L3.	JR $\frac{945}{160} > \frac{30}{20}$		$W = ① - ⑪ +$ 40' VDL
		JL $\frac{945}{160} > \frac{90}{20}$		$= 705 + 240$
				$= 945$K
				$W_1 =$ wheel ①
				$= 30$K
				$W_1 =$ wheel ① - ②
				$= 90$K
3.	wheel 3 @ L3.	JR $\frac{975}{160} > \frac{90}{20}$		$W = ① - ⑪ +$ 45' VDL
		JL $\frac{975}{160} < \frac{150}{20}$		$= 975$K.
		Satisfied.		$W_1 = ① - ②$
				$= 90$K
				$W_1 = ① - ③$
				$= 150$K

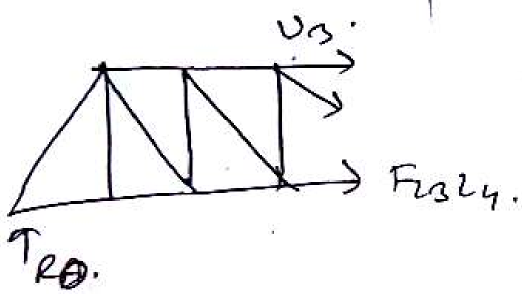
∴ wheel 3 @ L3 give max tension.

$$= \frac{0.75}{100} \times [60 \times (100+95+90+85) + 75 \times (70+65+60+55+50)] + \frac{1}{2} \times 45^2 \times \frac{0.75}{100} \times 6 + 60 \times \frac{0.75}{14.29} \times (14.29-5) + 30 \times \frac{0.3}{5.71} \times (15-14.29)$$

$$= 408.95\text{K}$$

$L_3L_4 = ?$





$$R_0 = \frac{x_8}{8 \times 25} \; ; \; R_8 = 1 - \frac{x_8}{200}$$

$\Sigma M_{U_3} = 0$

$\Rightarrow -F_{L_3L_4} \times 36 + R_0 \times 75 - 1 \times x_3$

$\Rightarrow F_{L_3L_4} = \frac{75R_0 - x_3}{36} \; (L_0 - L_3)$

$= \frac{75R_0}{36} \; [L_3 - L_8]$

x_3	R_0	$F_{L_3L_4}$
L_1	7/8	1.12
L_2	6/8	~~0.779~~
L_3	5/8	1.302
L_4	4/8	1.04
L_5	3/8	
L_6	2/8	
L_7	1/8	

দুইটা Same type question এর solve করলাম.

[illegible]