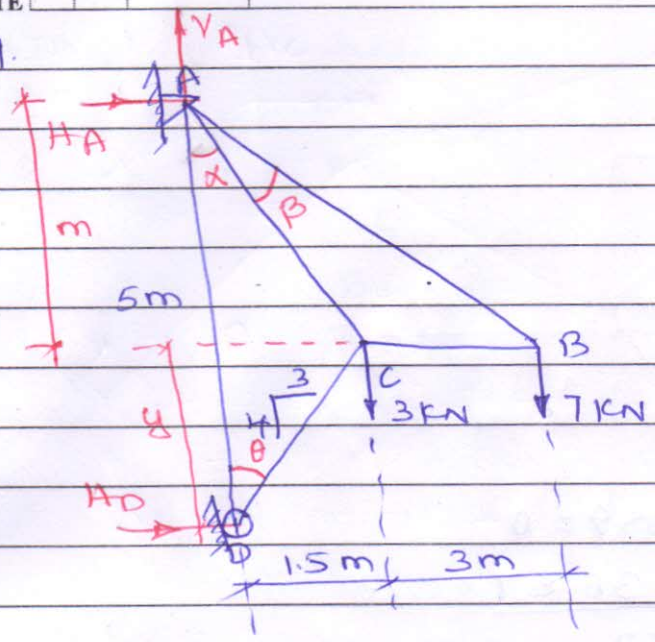
DATE

4/9.



To find the Support reaction

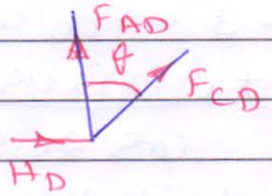
$\Sigma M_A = 0$

$H_D \times 5 = 3 \times 1.5 + 7 \times (1.5+3)$

$H_D = \frac{36}{5}$

$= 7.2$ KN

Joint D



$\tan\theta = \frac{3}{4}$

$\theta = 36.87^\circ$

$\Sigma F_x = 0$

$H_D + F_{CD} \sin\theta = 0$

$H_D = -F_{CD} \sin\theta$

$F_{CD} = -\frac{7.2}{\sin 36.87}$

$= -12$ KN

$y = \frac{1.5}{\tan 36.87}$

$= 2$ m

$m = 5 - 2 = 3$m

$\Sigma F_y = 0$

$F_{CD} \cos\theta + F_{AD} = 0$

$F_{AD} = -(-12 \times \cos 36.87)$

$= 9.60$ KN

$\tan\alpha = \frac{1.5}{3}$

$\alpha = 26.57^\circ$

$\tan(\alpha+\beta) = \frac{(3+1.5)}{3}$

$\alpha+\beta = 56.31^\circ$

$\beta = 56.31 - 26.57$

$= 29.74^\circ$

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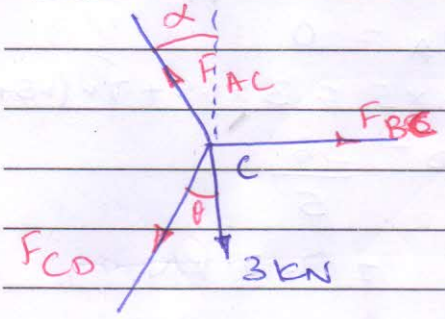
Joint C



$\Sigma F_y = 0$

$F_{AC} \cos\alpha - 3 - F_{CD} \cos\theta = 0$

$F_{AC} = \dfrac{3 + (-12) \times \cos 36.87}{\cos 26.57}$

$= -7.38$ KN

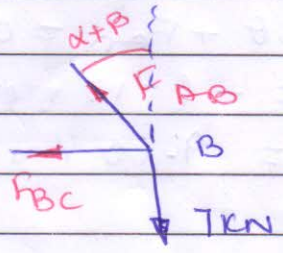
$\Sigma F_x = 0$

$F_{BC} = F_{CD} \sin\theta + F_{AC} \sin\alpha$

$= -12 \times \sin 36.87 + (-7.38) \times \sin 26.57$

$= -10.50$ KN

Joint B



$\Sigma F_y = 0$

$F_{AB} \cos(\alpha+\beta) = 7$

$F_{AB} = \dfrac{7}{\cos(26.57 + 29.74)}$

$= 12.62$ KN

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Sl No.	Member	Force (kN)	Type
1	CD	12	compression
2	AD	9.6	Tension
3	AC	7.38	Compression
4	BC.	10.50	compression
5	AB	12.62	Tension

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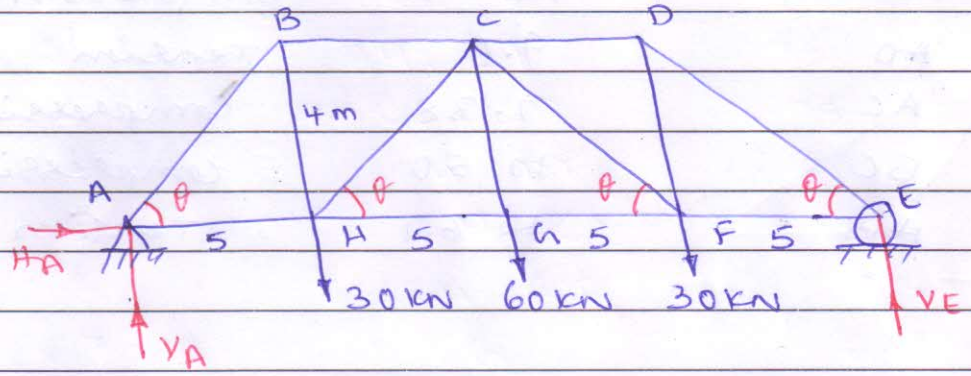


Solution

Since the forces is symmetrical
The vertical reaction will be equal

$\therefore V_A = V_E = \frac{30+60+30}{2}$

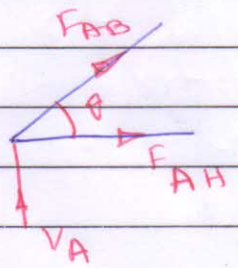
$V_A = V_E = 60$ KN

$H_A = 0$ (NO Horizontal force)

$\tan\theta = \frac{4}{5}$

$\theta = 38.66^\circ$

Joint A



$\Sigma F_y = 0$

$F_{AB} \sin\theta = V_A$

$F_{AB} = \frac{60}{\sin 38.66} = 96.05$ KN

$\Sigma F_x = 0$

$F_{AH} + F_{AB}\cos\theta = 0$

$F_{AH} = -96.05 \cos 38.66$

$= 75$ KN

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Joint B

$\Sigma F_x = 0$

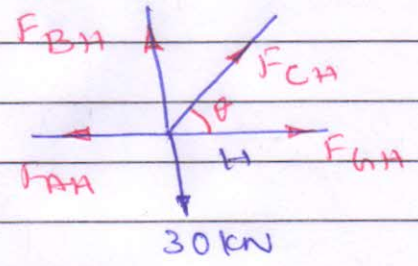
$F_{BC} = F_{AB} \cos\theta = 96.05 \times \cos 38.66 = 75$ KN

$\Sigma F_y = 0$

$-F_{BH} - F_{AB} \sin\theta = 0$

$F_{BH} = -96.05 \sin 38.66 = -60$ KN

Joint H



$\Sigma F_y = 0$

$F_{BH} + F_{CH} \sin\theta = 30$

$F_{CH} = \dfrac{30 - (-60)}{\sin 38.66} = 144$ KN

$\Sigma F_x = 0$

$F_{GH} + F_{CH} \cos\theta = F_{AH}$

$F_{GH} = 75 - 144 \times \cos 38.66 = -37.50$ KN

By inspection $F_{CH} = 60$ KN

Since the truss is symmetrical the forces in the symmetric members will be same.

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Sl No.	members	Force	Type
1	AB, DE	96.05	Tensile
2	AH, EF	75	Tensile
3	BC, CD	75	"
4	BH, DF	60	Compression
5	CH, CF	144	Tensile
6	GH, GF	37.50	Compression
7	CG	60	Tensile