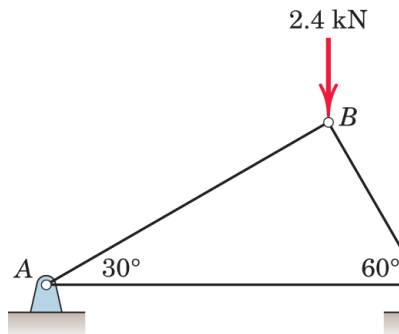


2023-1 Solid Mechanics Quiz #2

(2023.06.01.)

『Please write all the answers on this test sheets. You can also use the back side for the answers.』

1. Determine the force in each member of the loaded truss. [20 Points]



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Joint B:

2.4 kN

30° 60°

AB BC

AB = $2.4 \left(\frac{1}{2}\right)$
 $= 1.2 \text{ kN C}$

BC = $2.4 \left(\frac{\sqrt{3}}{2}\right)$
 $= 2.08 \text{ kN C}$

Joint C:

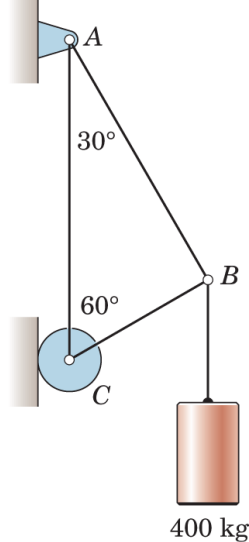
2.08 kN

60°

AC C

$\sum F_x = 0: -AC + 2.08 \cos 60^\circ = 0$
 $AC = 1.039 \text{ kN T}$

2. Determine the force in each member of the loaded truss. ($g=9.81\text{m/s}^2$) [20 Points]



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Joint B:

30° 60°

AB BC

400 (9.81) N

$\sum F_x = 0: BC - 400(9.81) \cos 60^\circ = 0$
 $BC = 1962 \text{ N C}$

$\sum F_y = 0: AB - 400(9.81) \sin 60^\circ = 0$
 $AB = 3400 \text{ N T}$

Joint C:

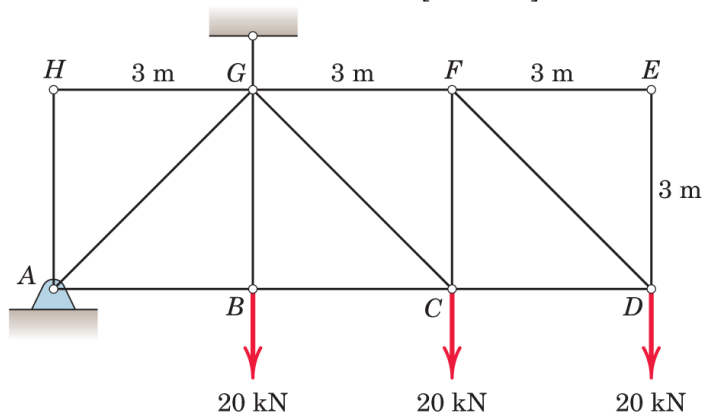
1962 N

30°

AC Cx Cy

$\sum F_y = 0: AC - 1962 \sin 30^\circ = 0$
 $AC = 981 \text{ N T}$

3. Determine the force in member CG. [20 Points]

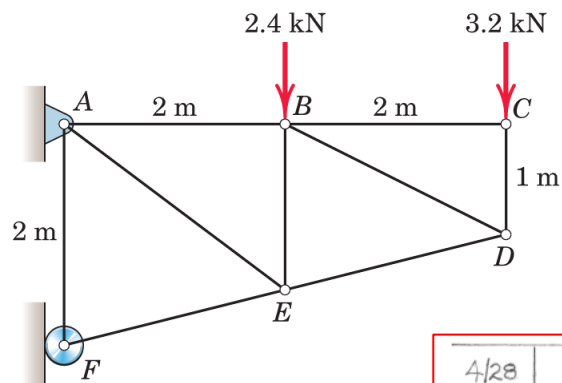


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$$\sum F_y = 0: CG \sin 45^\circ - 20 - 20 = 0$$

$$CG = 56.6 \text{ kN T}$$

4. Determine the force in member AE of the loaded truss. [20 Points]



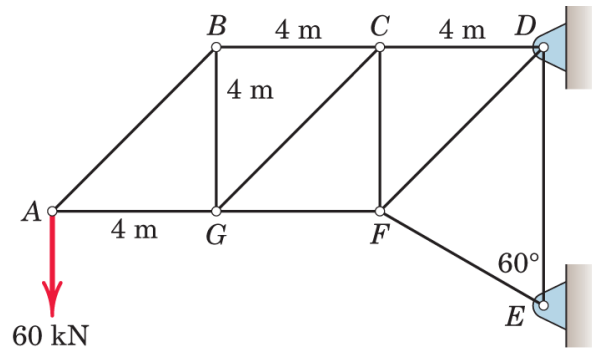
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$$\alpha = \tan^{-1} \frac{1.5}{2} = 36.9^\circ$$

$$\sum M_G = 0: 3.2(4) + 2.4(6) - AE \cos \alpha (1.5) - AE \sin \alpha (6) = 0$$

$$AE = 5.67 \text{ kN T}$$

5. Determine the forces in members BC and CG. [20 Points]



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60 kN

$$+\uparrow \sum F = 0 : CG \frac{\sqrt{2}}{2} - 60 = 0, \quad CG = 84.9 \text{ kN T}$$

$$+\circlearrowleft \sum M_G = 0 : 60(4) - BC(4) = 0, \quad BC = 60 \text{ kN T}$$