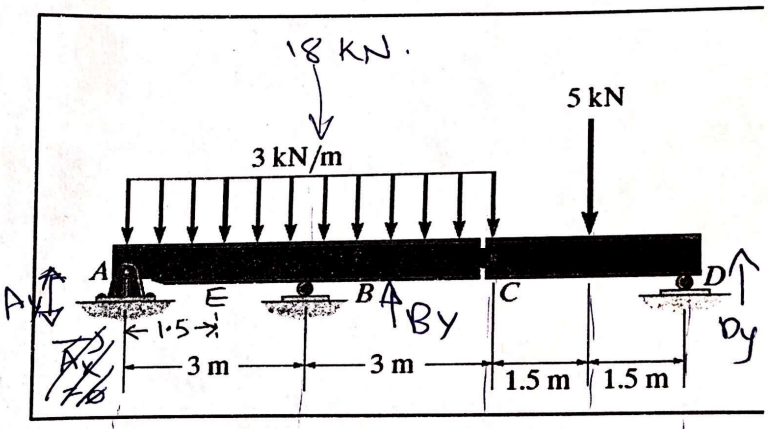
Problem 3

Draw the shear and bending moment diagrams for the compound supported beam shown in the Figure

Question No. 8 (Maximum Shear)

Question No. 9 (Maximum Moment)

Question No. 10 (Moment at E)



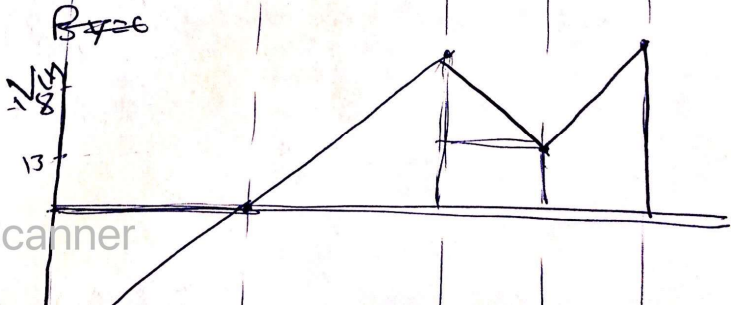
$\Sigma M_A = 0.$

$By \times 3 - 18 \times 3 = 0.$

$By = 18 kN$

$\Sigma F_y = 0 \rightarrow 18 + Ay = 0.$

$Ay = -18 kN$



$\sum M_F = 0.$

$$-2 \times \frac{12}{13} \times 1.2 + 3.82 \times \cos 14 \times 0.9 + F_{GD} \cos 37 \times 0.9 = 0$$

$$-2.22 + 3.34 + 0.72 F_{GD} = 0.$$

$$1.12 + 0.72 F_{GD} = 0.$$

$$F_{GD} = -1.56 \text{ N} \quad (C)$$

em 2

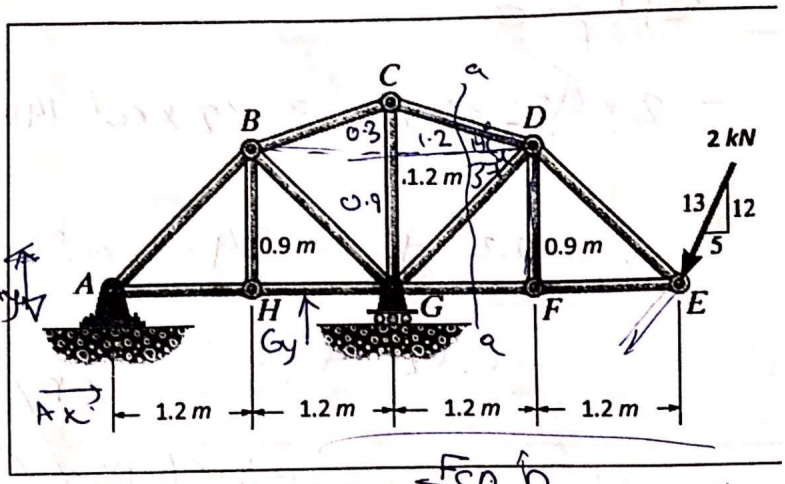
termine the force in members, ndicated in Questions 4-7, of the truss shown and state if the members are in tension or compression.

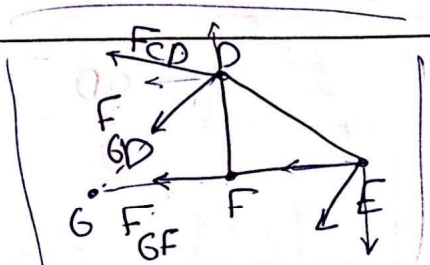
Question No. 4 (member GF)

Question No. 5 (member GD)

Question No. 6 (member CD)

Question No. 7 (member GB)





~~No 4. $\sum M_G = 0$.~~ $\sum F_x = 0$.

$A_x - 2 \times \frac{5}{13} = 0$.

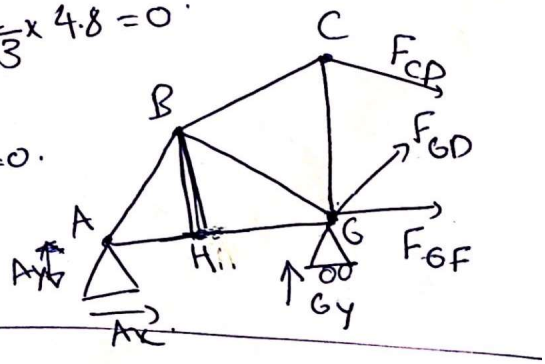
$A_x = 0.77\,N$

$\sum M_A = 0 \rightarrow G_y \times 2.4 - 2 \times \frac{12}{13} \times 4.8 = 0$.

$G_y = 3.7\,N$

$\sum F_y = 0 \rightarrow 3.7 + A_y - 2 \times \frac{12}{13} = 0$.

$A_y = -1.85\,N$



$\sum M_G = 0 \rightarrow F_{CD} \cos 14 \times 0.9 + F_{CD} \sin 14 \times 1.2 - 2 \times \frac{5}{13} \times 2.4 = 0$

$0.87 F_{CD} + 0.29 F_{CD} - 4.43 = 0$.

$F_{CD} = 3.82\,N$ (T)

$F_{GF} = -3.23\,N$ (C)

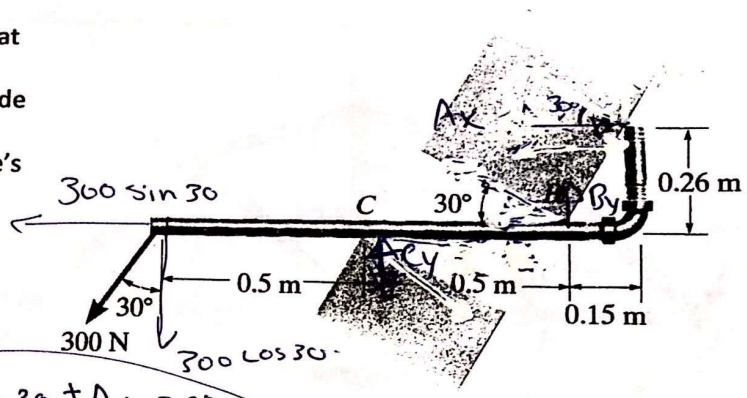
$\sum M_D = 0$

$-F_{GF} \times 0.9 - 2 \times \frac{5}{13} \times 0.9 - 2 \times \frac{12}{13} \times 1.2 = 0$.

$0.9 F_{GF} - 0.69 - 2.22 = 0$.

Problem 1

The smooth pipe rests against the opening at the points of contact *A*, *B*, and *C*. Determine the magnitude of reactions at these points needed to support the force of 300 N. Neglect the pipe's thickness in the calculation.



Question No. 1 (Reaction at *A*)

Question No. 2 (Reaction at *B*)

Question No. 3 (Reaction at *C*)

$300 \sin 30 + A_x = 0$

$A_x = -150\,N \rightarrow$

$\Sigma F_x = 0 \rightarrow$

$300\sin 30 + A_x = 0$

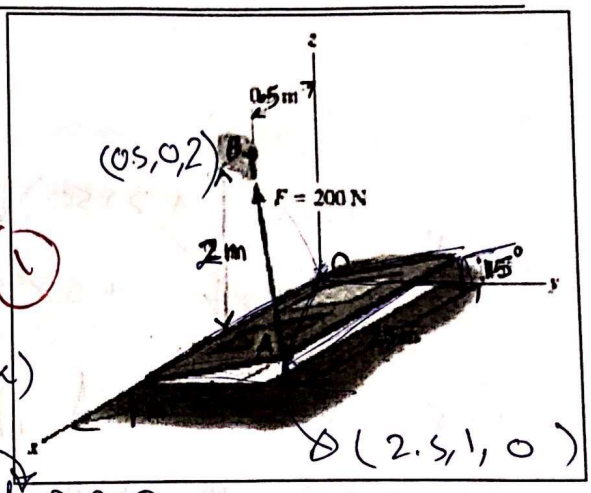
$A_x = 150\,N \rightarrow$

$300\sin 30 + A_x \cos$

$A_x = 173.2$

$\Sigma M_C = 0 \circlearrowleft$

1- Determine the magnitude of the moment of the Force F about point O.



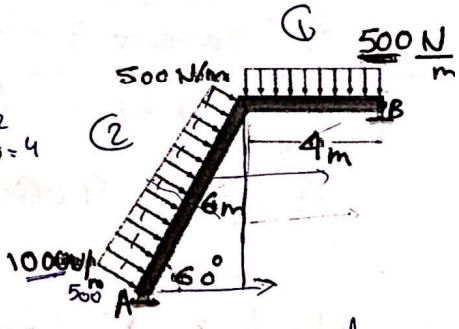
$$\vec{F} = F \times \left[\frac{\vec{r}_{AB}}{|r_{AB}|} \right]$$

$$200 \times \left[\frac{-2\hat{i} - 1\hat{j} + 2\hat{k}}{3} \right] \quad (1)$$

$$200 \times (-0.6\hat{i} - 0.33\hat{j} - 0.6\hat{k})$$

$$\vec{F} = -120\hat{i} - 66\hat{j} - 120\hat{k}$$

2- Replace the loading by an equivalent resultant force and Couple moment acting at point B.



① F = area under curve

$500 \times 4 = 2000\,N \downarrow$

② $F = 500 \times 6 = 3000\,N \downarrow$ (2) $\frac{2}{3} \times 6 = 4$

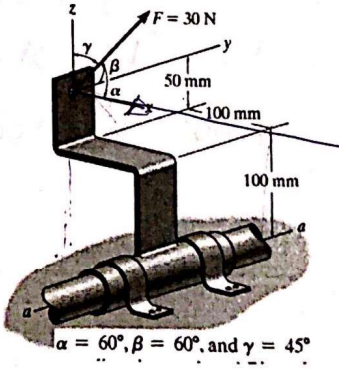
$F = \frac{1}{2} \times 6 \times 500 = 1500\,N \downarrow$

$F_{R\,of\,②} = 1500 + 3000 = 4500\,N$ 60°

$F_x = 4500 \times \cos 30 = 3897\,N \rightarrow$

$F_y = 4500 \times \sin 30 = 2250\,N \downarrow$

3- Determine the moment about the a-a axis.



$F_x = 30 \times \cos 60 = 15\,N$

$F_y = 30 \times \cos 60 = 15\,N$

$F_z = 30 \times \cos 45 = 21.21\,N$ (3)

$\vec{F} = 15\hat{i} + 15\hat{j} + 21.21\hat{k}$

$\vec{r} = -100\hat{i} + 150\hat{k}$