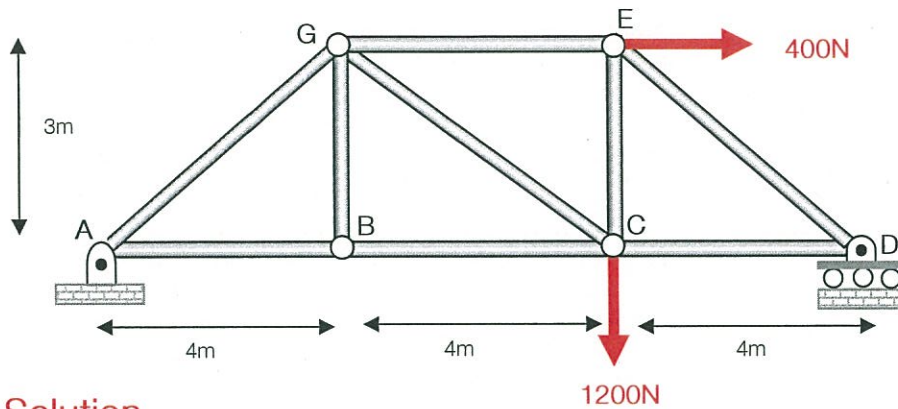


WORKED SOLUTIONS

# ENST2.2: METHOD OF SECTIONS

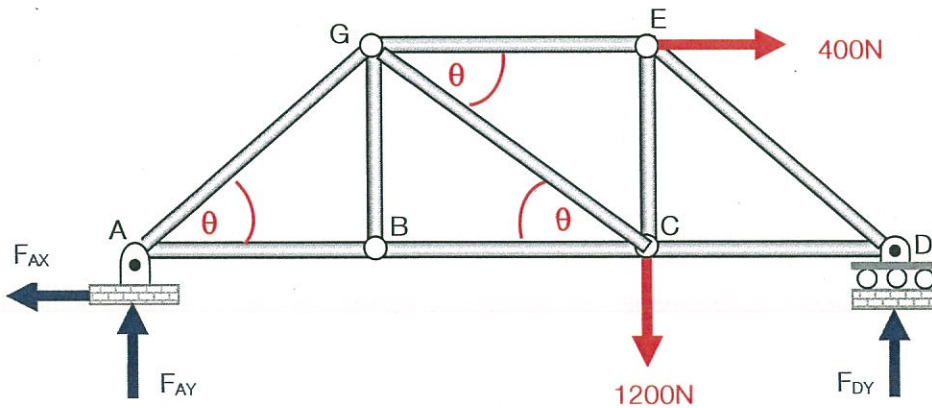
Question

Determine any reactions, and the forces in members GE, GC and BC of the truss shown below using the method of sections. State if the members are in tension (T) or compression (C).  
 (Hibbeler, R.C, 2010, *Engineering Mechanics: Statics and Dynamics*, Pearson)



Worked Solution

Calculate the support forces (reactions) first

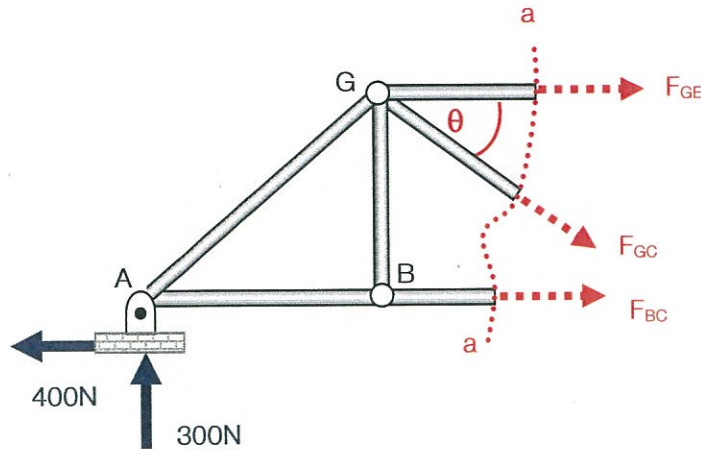


By trigonometry

$$\sin \theta = 3/5$$

- $\rightarrow \sum F_x = 0 : 400 - F_{Ax} = 0 \Rightarrow F_{Ax} = 400 \text{ N (left)}$
- $+ \curvearrowright \sum M_D = 0 : (400 \times 3) + (F_{Ay} \times 12) - (1200 \times 4) = 0 \Rightarrow F_{Ay} = 300 \text{ N (up)}$
- $+ \uparrow \sum F_y = 0 : 300 + F_{Dy} - 1200 = 0 \Rightarrow F_{Dy} = 900 \text{ N (up)}$

Cut or section **a-a** the truss through the members where the forces are to be found



Note: • Use left side of truss as there are fewer forces acting  
 • Forces along section are assumed to be in tension  
 • Only external forces  $F_{BC}$ ,  $F_{GC}$ ,  $F_{GE}$ ,  $F_{Ay}$ ,  $F_{Ax}$  used

•  $+2 \sum M_G = 0$  Taking moments about G eliminates  $F_{GC}$ ,  $F_{GE}$

$$(400 \times 3) + (300 \times 4) - (F_{BC} \times 3) = 0 \Rightarrow F_{BC} = 800 \text{ N (T)}$$

•  $+2 \sum M_C = 0$  Note: • Moment taken about a joint outside of section is still OK  
 • Moment about C eliminates  $F_{GC}$  and  $F_{BC}$

$$(300 \times 8) + (F_{GE} \times 3) = 0 \Rightarrow F_{GE} = -800 \text{ N (C)}$$

Note:  $F_{GE}$  is -, ∴ assumed direction incorrect, i.e. Compression

•  $+ \uparrow \sum F_y = 0$  Note: Moments not required, only  $F_{Ay}$  and vertical component of  $F_{GC}$  needed

$$300 - F_{GC} \sin \theta = 0 \Rightarrow 300 - F_{GC} \times \frac{3}{5} = 0 \Rightarrow F_{GC} = 500 \text{ N (T)}$$

Summary  $F_{Ax} = 400 \text{ N (left)}$ ,  $F_{Ay} = 300 \text{ N (up)}$ ,  $F_{Dy} = 900 \text{ N (up)}$

$F_{BC} = 800 \text{ N (T)}$ ,  $F_{GE} = 800 \text{ N (C)}$ ,  $F_{GC} = 500 \text{ N (T)}$