EWCE-311

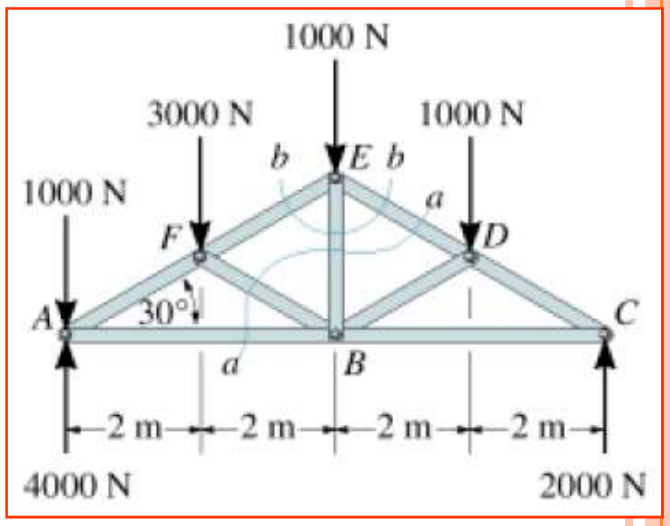
STRUCTURAL ANALYSIS AND DESIGN-I

Practice examples on truss analysis

Lecture 4

Instructor: Dr. Noor M S Hasan

Example: In the following truss, find the force in member (EB).



Solution

Notice that no single cut will provide the answer. Hence, it is best to consider section (a-a and b-b).

$$\sum M_A = 0$$

$$R_C * 8 - 1000 * 6 - 1000 * 4 - 3000 * 2 = 0$$

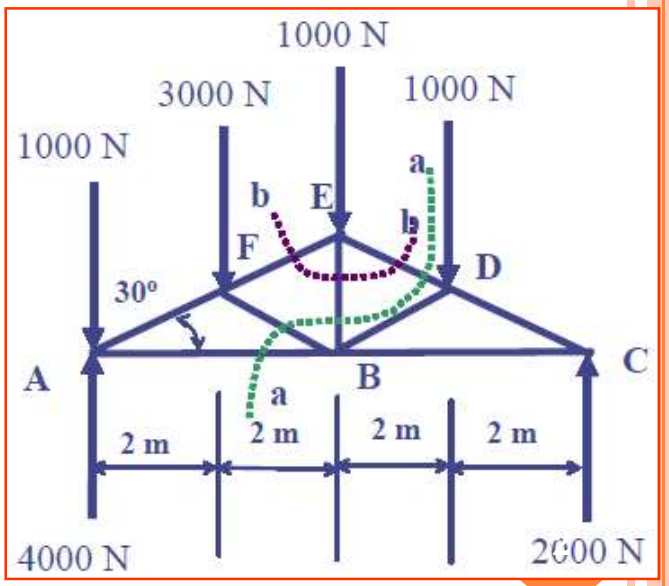
$$R_C = 2000 \text{ N}$$

$$\sum F_y = 0$$

$$R_A + R_C - 1000 - 1000 - 3000 - 1000 = 0$$

$$R_A = 4000 \text{ N}$$

Taking the moment about joint (B), to find (F_{ED}), as shown in below figure:



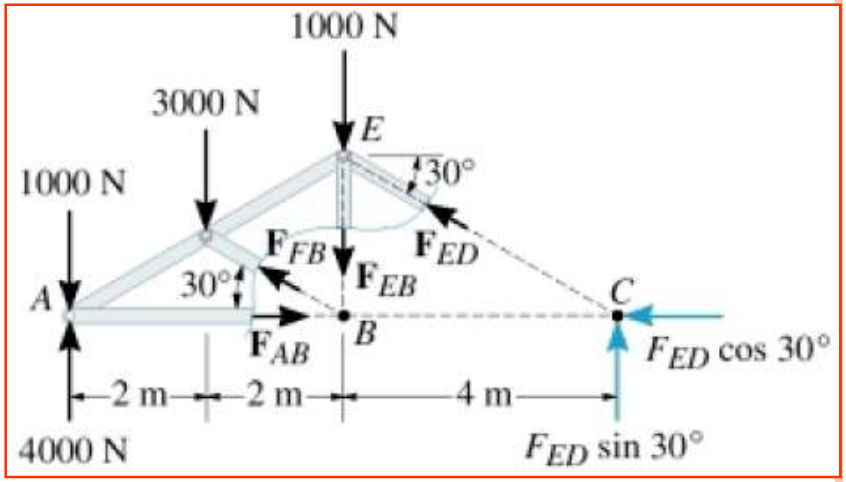
$$\sum M_B = 0$$

$$1000 * 4 + 3000 * 2 - 4000 * 4 + F_{ED} * \sin 30^o * 4 = 0$$

$$F_{ED} = 3000 \text{ N} \quad \text{(compression)}$$

Continue Example :

From joint (E) to find (F_{EB}), as shown in below figure:



$$\sum F_x = 0$$

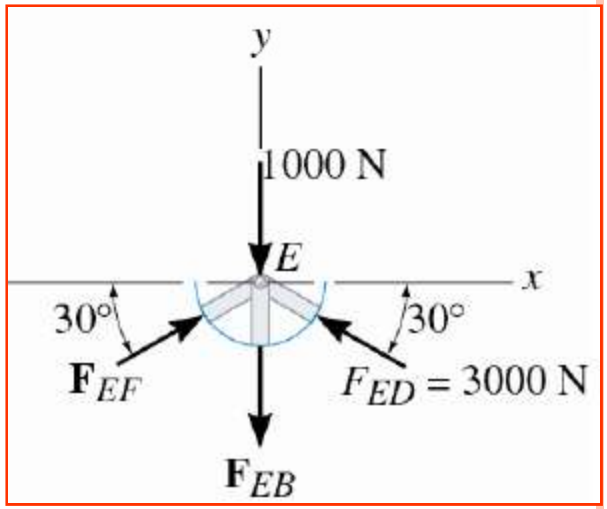
$$F_{EF} \cdot \cos 30^o - 3000 \cos 30^o = 0$$

$$F_{EF} = 3000 \text{ N} \quad \text{(compression)}$$

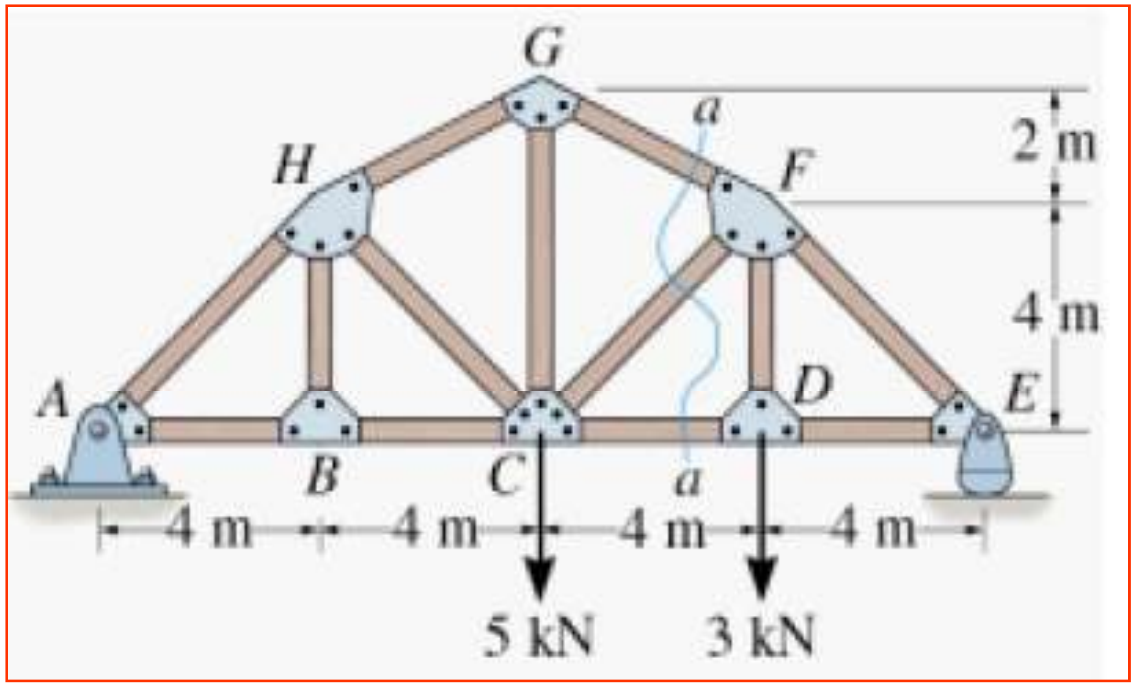
$$\sum F_y = 0$$

$$F_{EF} \cdot \sin 30^o + 3000 \cdot \sin 30^o - 1000 - F_{EB} = 0$$

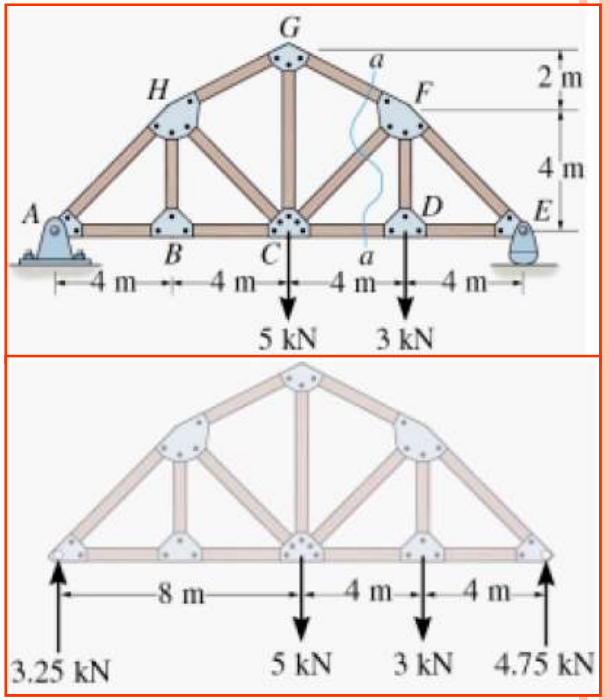
$$F_{EB} = 2000 \text{ N} \quad \text{(Tension)}$$



Example : In the following Bowstring Truss, find the force in member (CF).



Example 2: In the following Bowstring Truss, find the force in member (CF).



Solution

draw the FBD and find the support reactions which are shown below

$\sum M_A = 0$

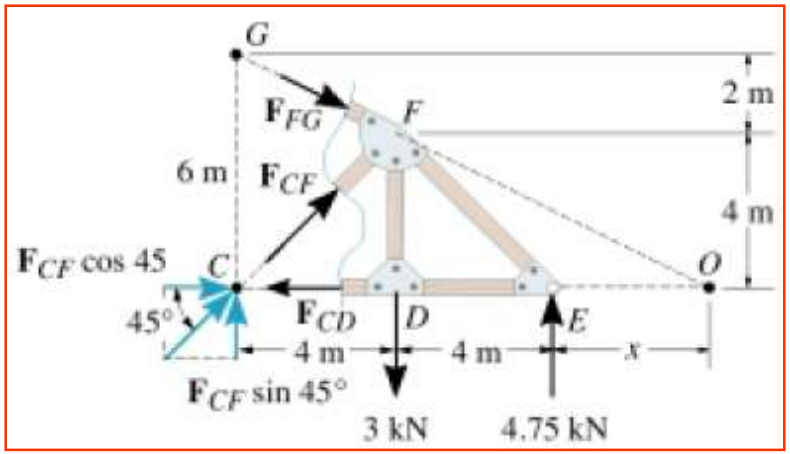
$R_E * 16 - 5 * 8 - 3 * 12 = 0$

$R_E = 4.75\ kN$

$\sum F_y = 0$

$R_E + R_A - 5 - 3 = 0$

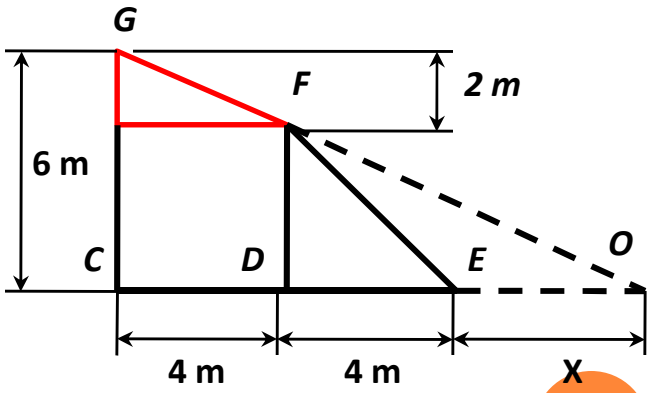
$R_A = 3.25\ kN$



$$\sum M_O = 0$$

$$-F_{CF}\sin 45^\circ (12\,m) + (3\,kN)(8\,m) - (4.75\,kN)(4\,m) = 0$$

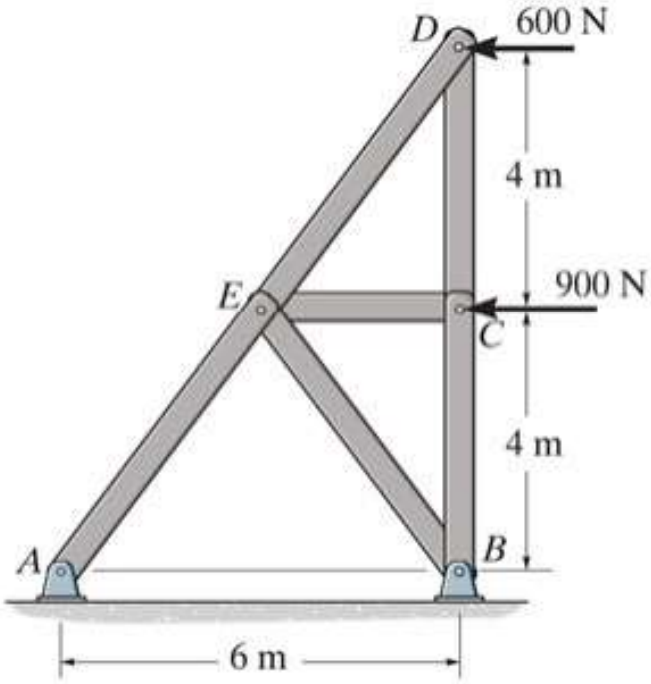
$$F_{CF} = 0.589\,kN\,(C)$$



$$\frac{2}{4} = \frac{6}{(4+4+X)} \rightarrow X = 4\,m$$

Analysis of Truss:

GROUP PROBLEM SOLVING



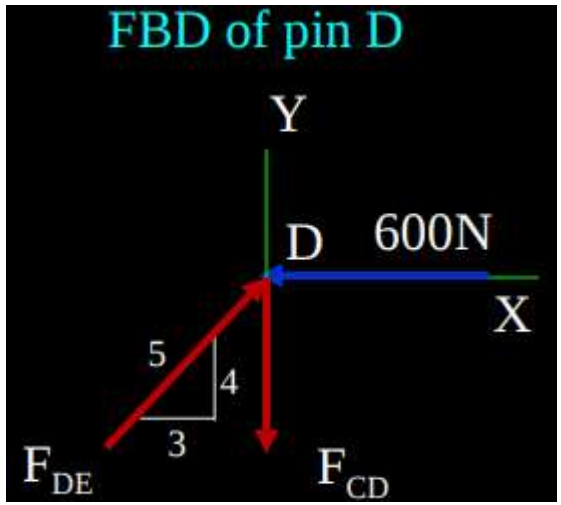
Given: Loads as shown on the truss

Find: Determine the force in all the truss members (do not forget to mention whether they are in T or C).

a) Check if there are any zero-force members. Is Member CE zero-force member?

b) b) Draw FBDs of pins D, C, and E, and then apply E-of-E at those pins to solve for the unknowns.

Analysis of Truss:

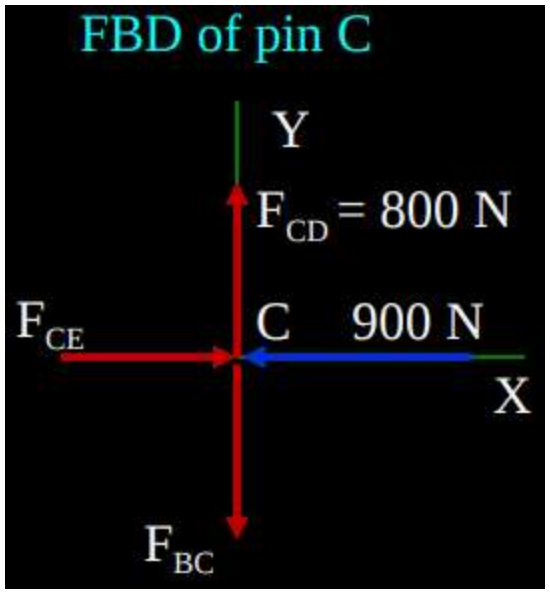


Analysing pin D: $\Sigma F_X = F_{DE}\,(3/5) - 600 = 0$

$F_{CD} = 1000\ N = 1.00\ kN\ (C)$

$\Sigma\ F_Y = 1000\,(4/5) - F_{CD} = 0$

$F_{DE} = 800\ N = 0.8\ kN\ (T)$



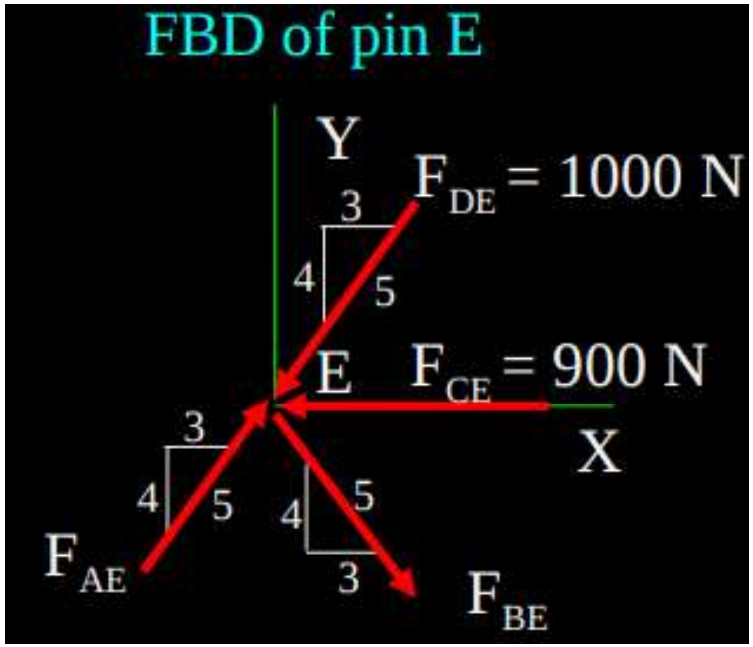
Analysing pin C: $\Sigma\ F_X = F_{CE} - 900 = 0$

$F_{CE} = 900\ N = 0.90\ kN\ (C)$

$\Sigma\ F_Y = 800 - F_{BC} = 0$

$F_{BC} = 800\ N = 0.80\ kN\ (T)$

Analysis of Truss:



Analysing pin E: $\Sigma F_X = F_{AE}\,(3/5) + F_{BE}\,(3/5) - 1000\,(3/5) - 900 = 0$

$\Sigma F_Y = F_{AE}\,(4/5) - F_{BE}\,(4/5) - 1000\,(4/5) = 0$

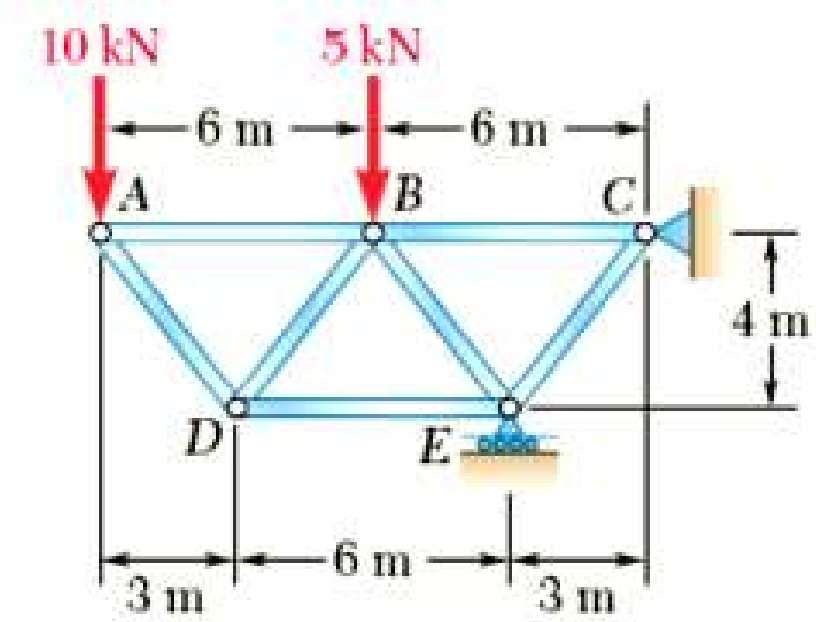
Solving these two equations, we get F_{AE} = 1750 N = 1.75 kN (C)

F_{BE} = 750 N = 0.75 kN (T)

Analysis of Truss:

Find support reactions and member forces of the truss:

(1)

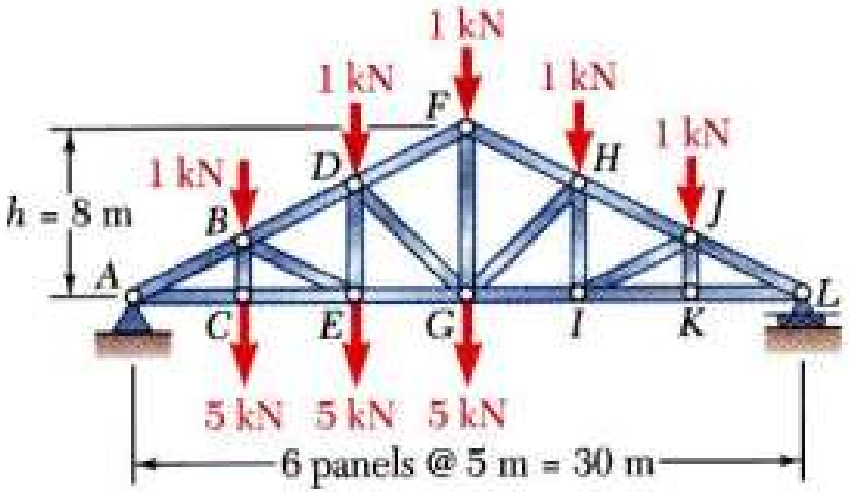


Using the method of joints, determine the force in each member of the truss.

Analysis of Truss:

(2)

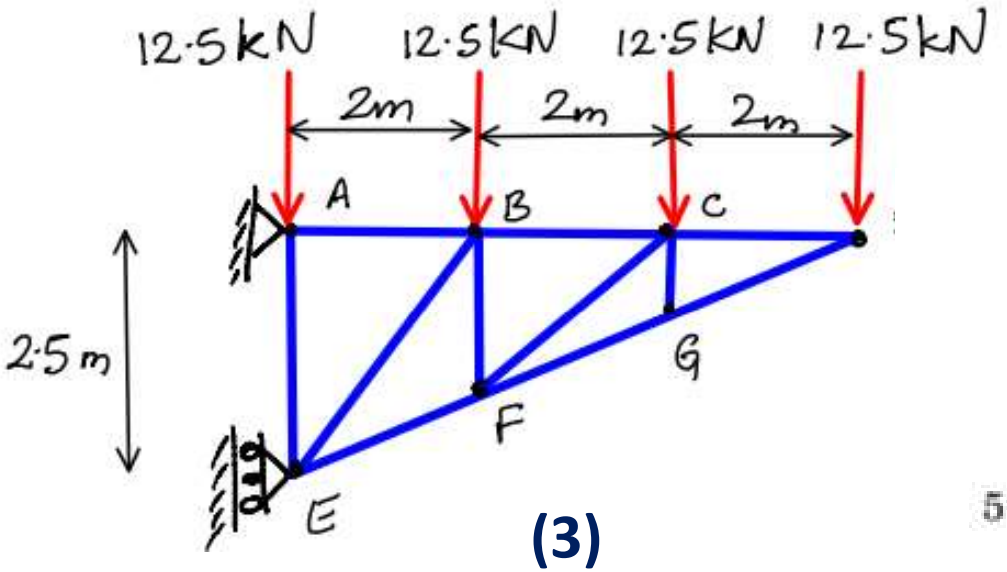
Method of Sections: Example



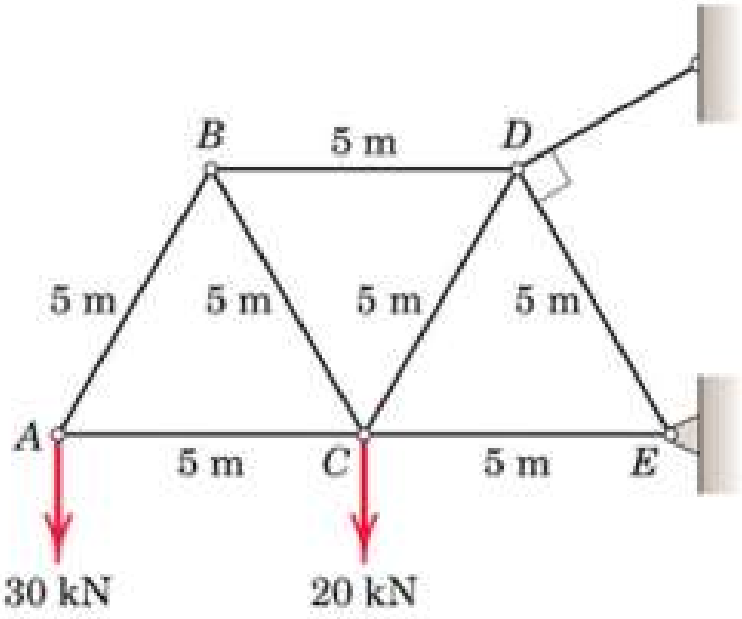
Find out the internal forces in members FH, GH, and GI

Analysis of Truss:

Find support reactions and member forces (marked) of the truss:



(3)

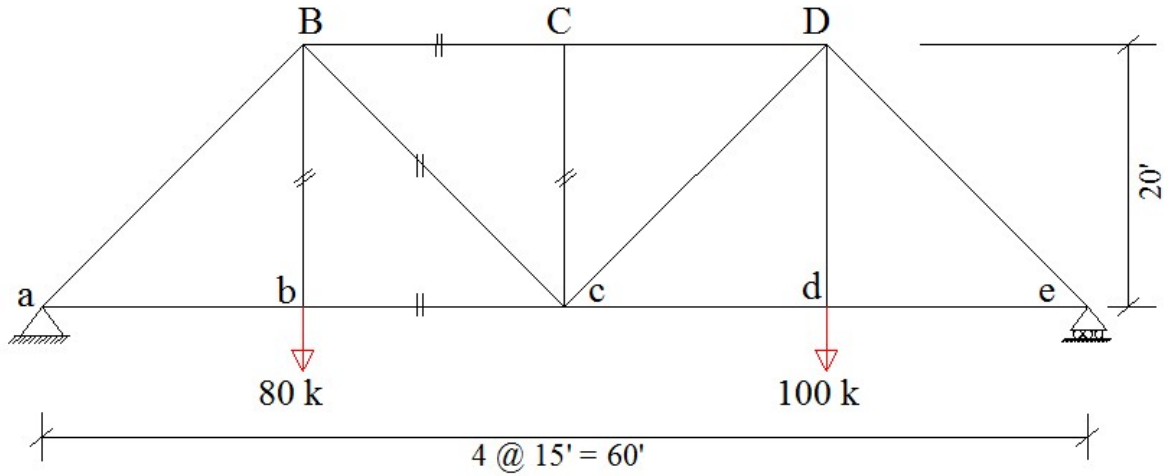


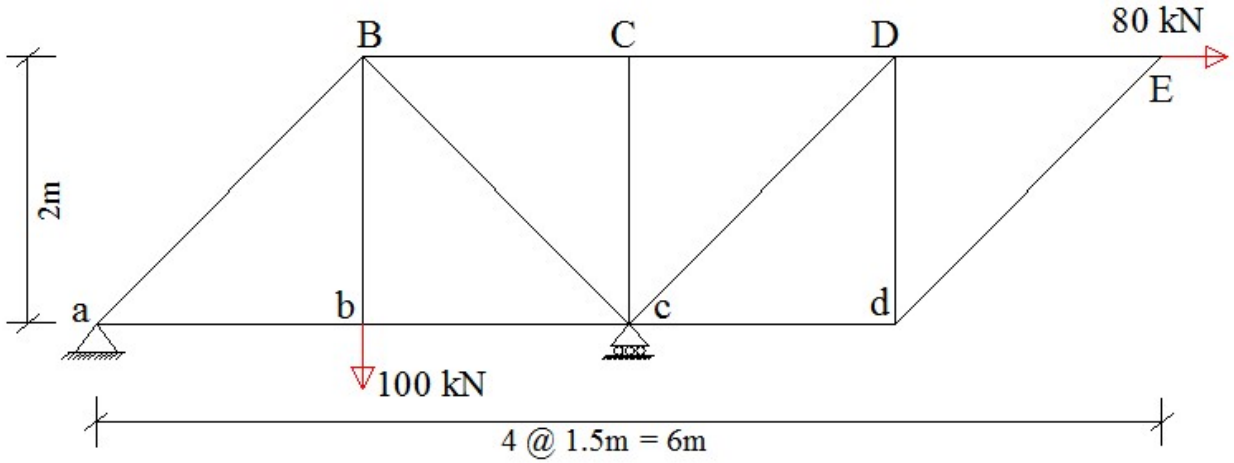
(4)

Analysis of Truss:

Find support reactions and member forces (marked) of the truss:

(5)





(6)