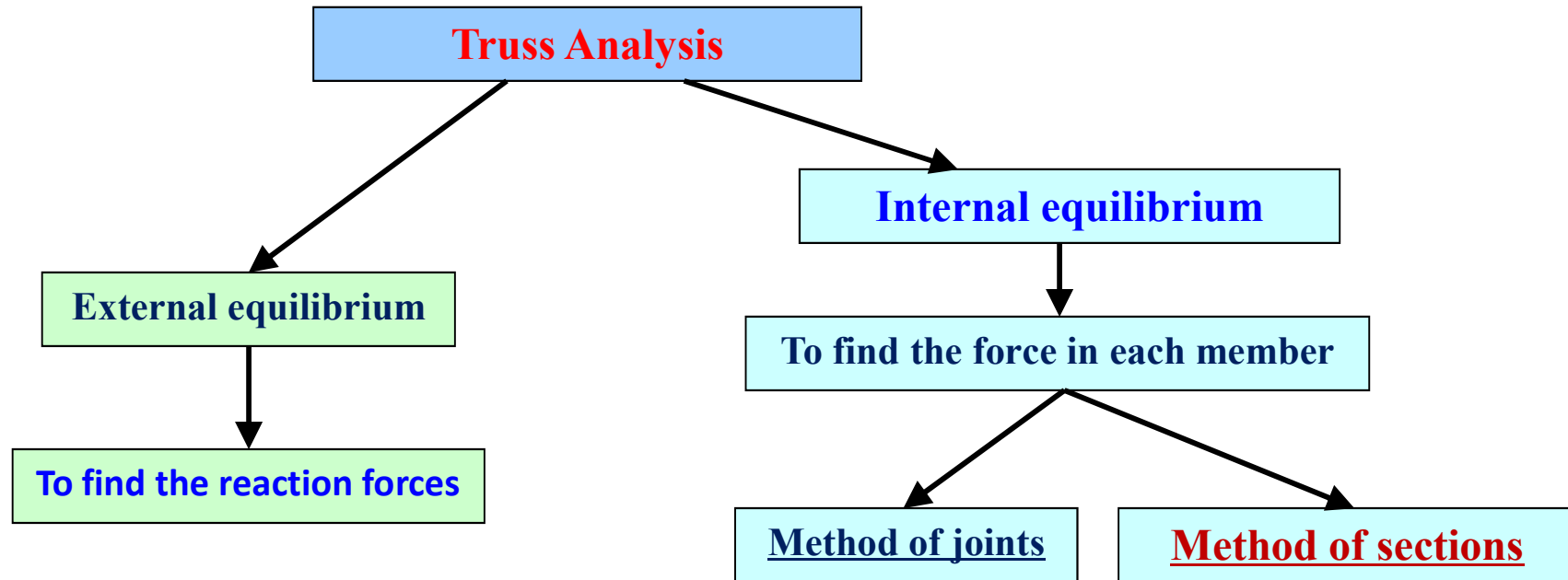


# Mechanics



*by*  
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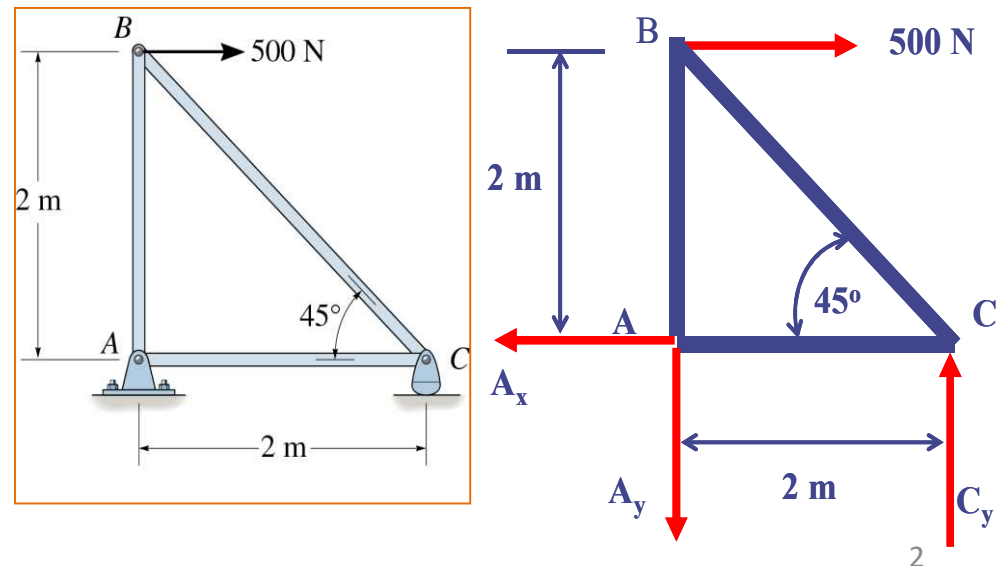
# Analysis of Trusses: Method of Section



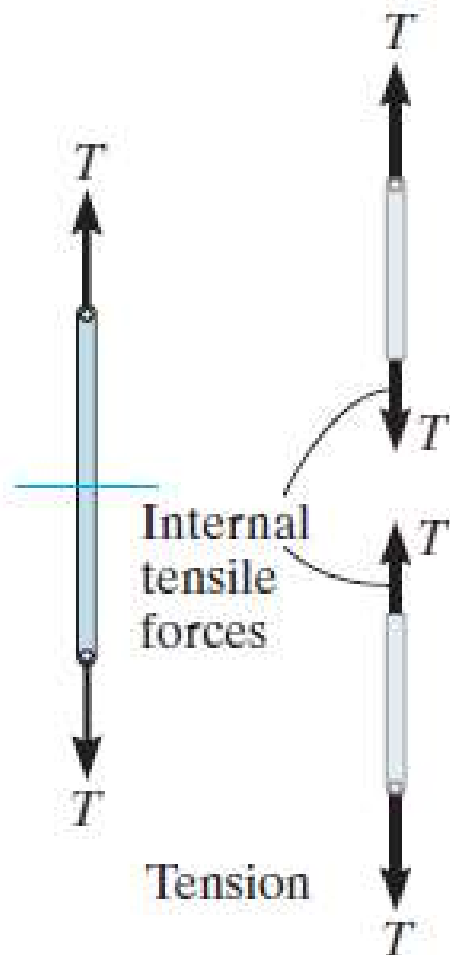
**External Equilibrium:** to find the *reaction forces*, follow the below steps:

1. Draw the **FBD** for the entire truss system.
2. Determine the *reactions*. Using the equations of (2 D) which states:

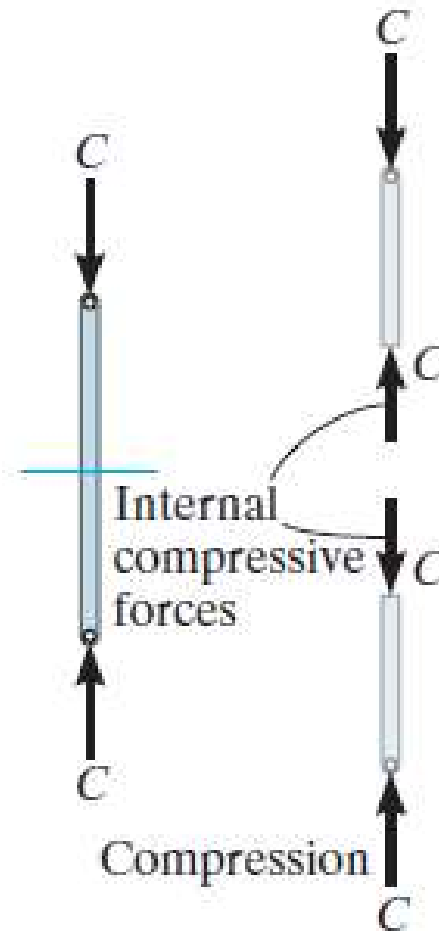
$$\sum F_x = 0, \quad \sum F_y = 0, \quad \sum M_o = 0$$



## Sign Convention: For the force in member



**Positive**



**Negative**

# Analysis of Trusses: Method of Section

**Method of section (Internal equilibrium):** to find the **forces** in any **member**, choose a **section**, to which that **member** is appeared as an internal force, and follow the below steps:

1. Draw the **FBD** for the entire truss system.
2. Determine the **reactions**. Using the equations of (**2 D**) which states:

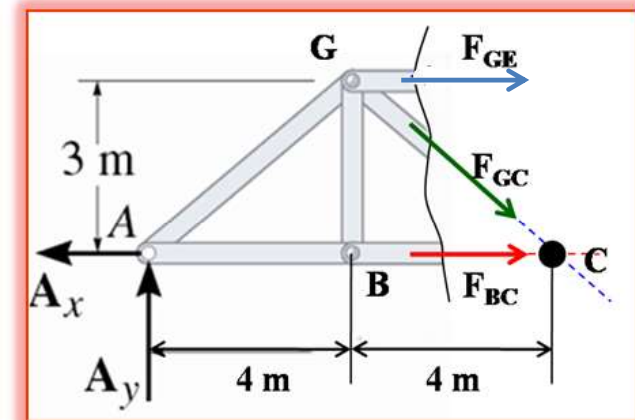
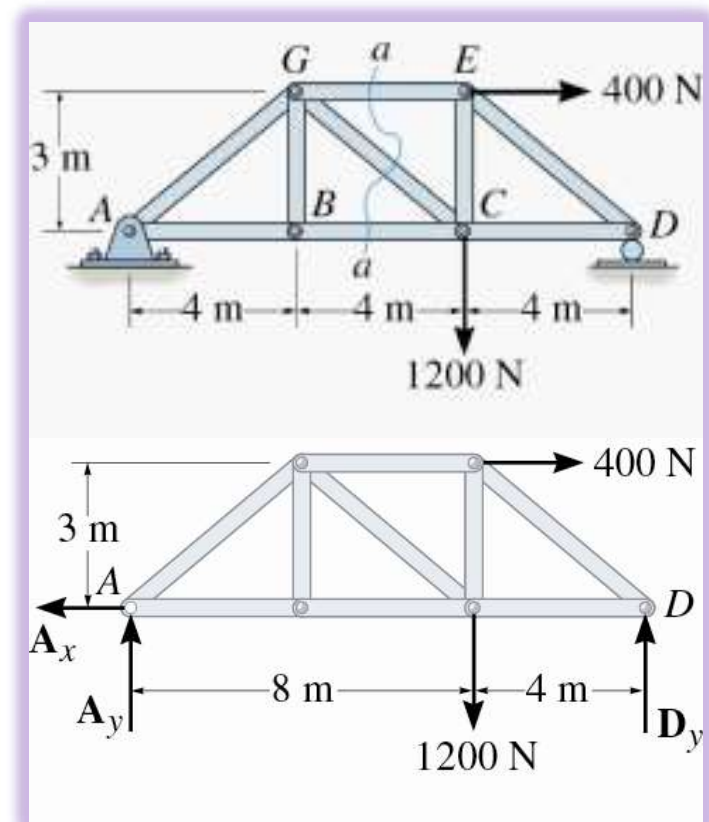
$$\sum F_x = 0, \quad \sum F_y = 0, \quad \sum M_o = 0$$

3. Choose the **section**, and draw **FBD** of that **section**, shows how the forces replace the sectioned members.
4. Using the equation of (**2 D**) which states:

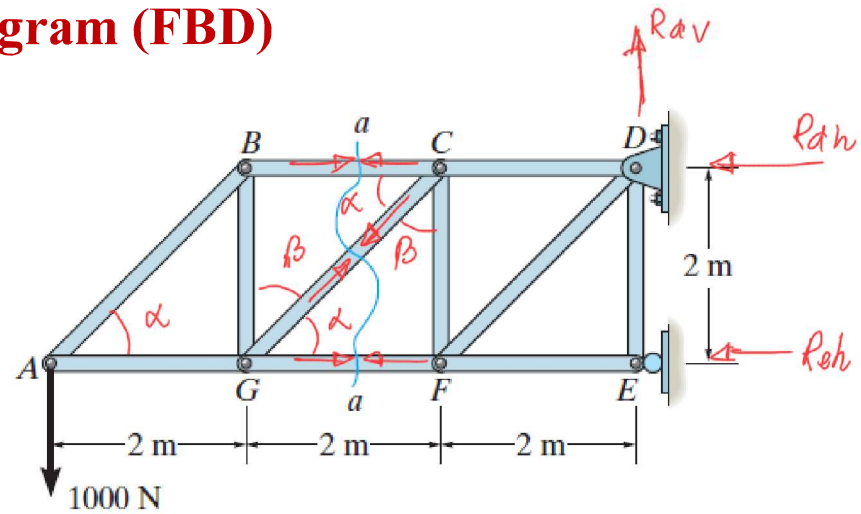
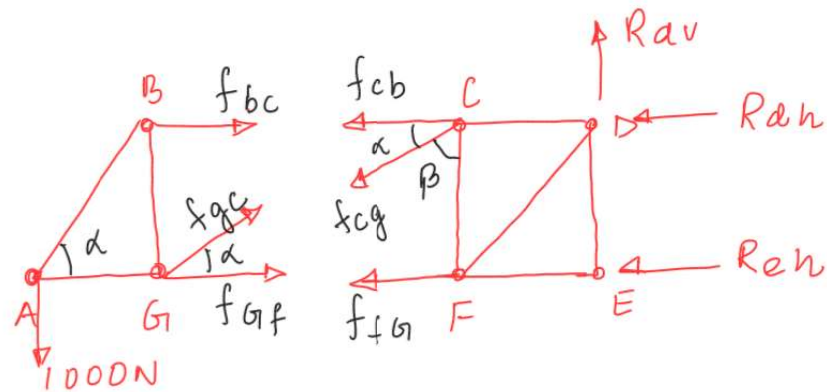
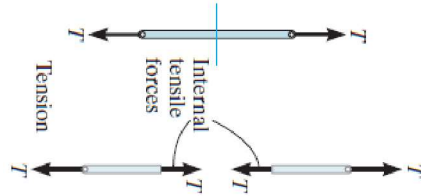
$$\sum F_x = 0, \quad \sum F_y = 0, \quad \sum M_o = 0$$

5. The **internal forces** are determined.
6. Choose another **section** or **joint**.

02-12-2020



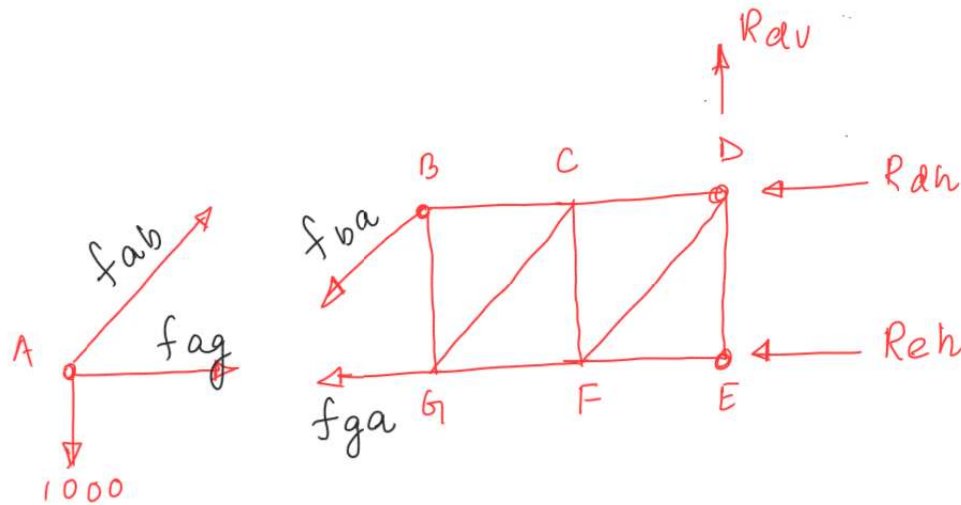
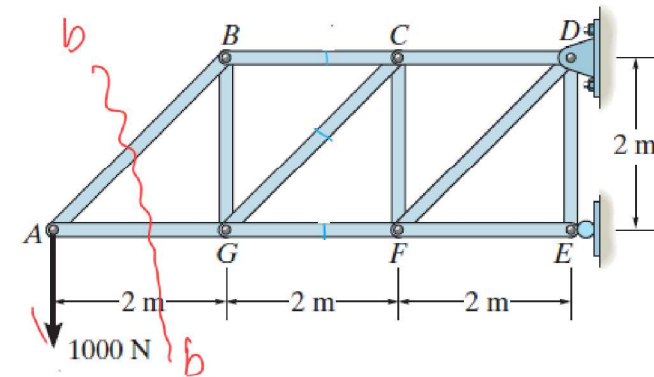
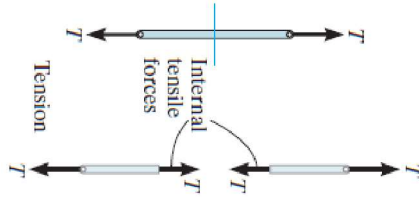
## Free Body Diagram (FBD)



$$\sum F_x = 0 ; \sum F_y = 0 ; \sum M_{A/B/G/C/F/D/E} = 0$$

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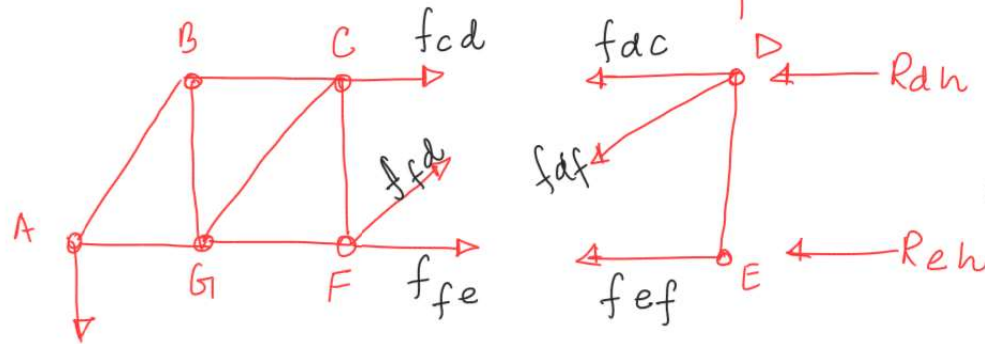
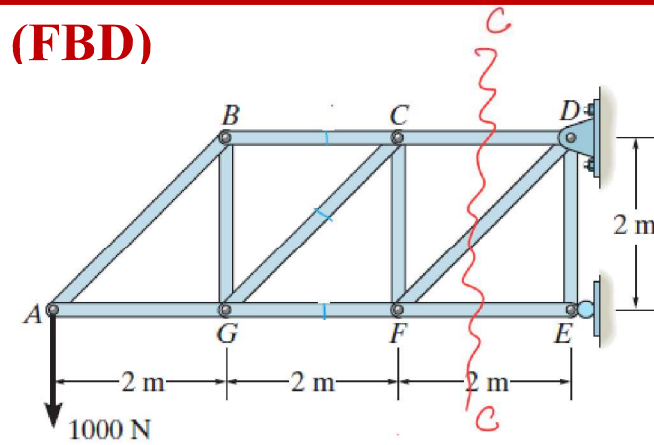
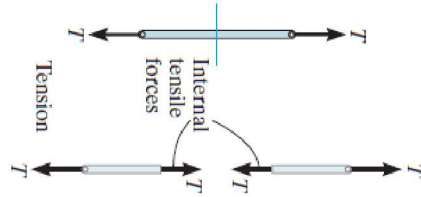
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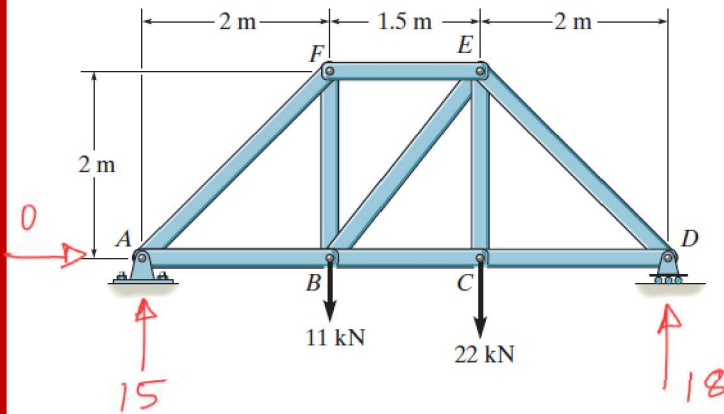
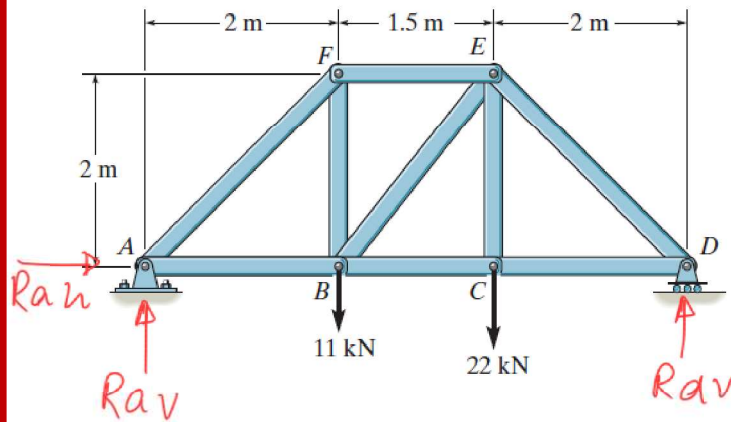
## Free Body Diagram (FBD)



$$\sum F_x = 0 ; \sum F_y = 0 ; \sum M_{A/B/G/C/F/D/E} = 0$$

$$\sum F_x = 0 ; \sum F_y = 0 ; \sum M_{A/B/G/C/F/D/E} = 0$$

**Problem Statement :** Determine the force developed in members FE, EB, and BC of the truss and state if these members are in tension or compression using “Method of Sections”.



$$\bar{\Sigma}_\ell F_2 = 0 \longrightarrow +ve$$

$$+ R_{ah} = 0$$

$$\bar{y} F_y = 0 \quad \uparrow +ve$$

$$+R_{av} - 11 - 22 + R_{av} = 0$$

$\Sigma M_A = 0 \quad \curvearrowright +ve$

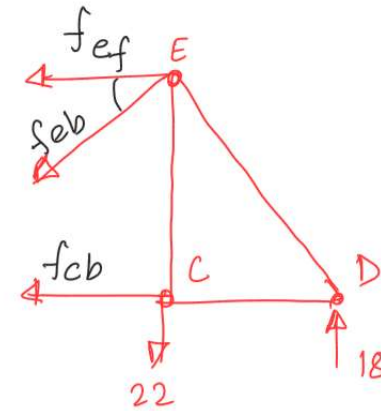
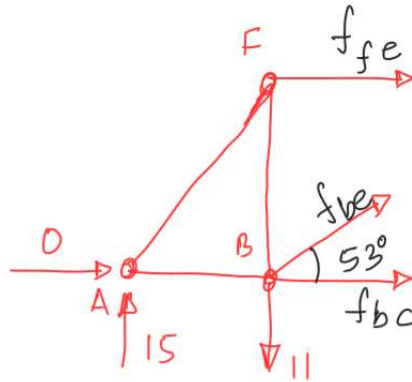
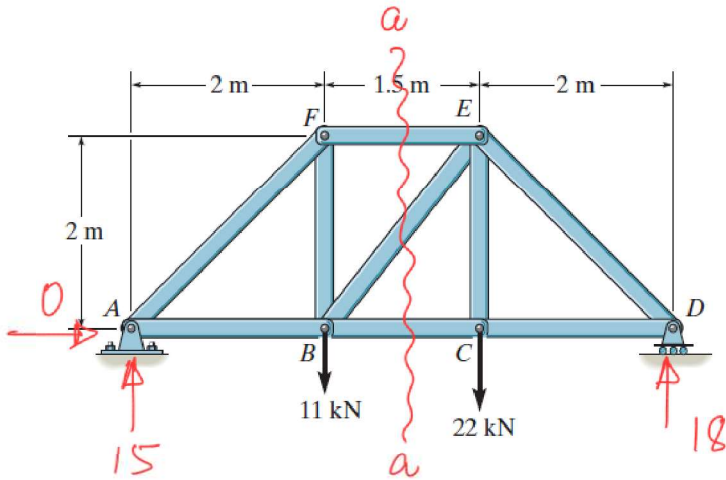
$$+11 \times 2 + 22 \times 3.5 - R_{av} \times 5.5 = 0$$

$$\circ \quad R_{dv} = 18 \text{ kN}$$

$$R_{av} = 15 \text{ kN}$$



**Problem Statement (cont.):** Determine the force developed in members FE, EB, and BC of the truss and state if these members are in tension or compression “Method of Sections”.



$$\xrightarrow{+} \sum F_x = 0 \quad ; \quad \uparrow +ve \sum F_y = 0 \quad ; \quad + \curvearrowright \sum M_{A/B/F/E/C/D} = 0$$

$$0 + f_{fe} + f_{be} \cos 53^\circ + f_{bc} = 0 \quad \text{--- (i)}$$

$$+15 + f_{be} \sin 53^\circ - 11 = 0 \quad \text{--- (2)}$$

$$+ 15 \times 3.5 - 11 \times 1.5 + f_{fe} \times 2 + f_{be} \sin 53^\circ \times 1.5 = 0 \quad \text{--- (3) } [\Sigma M_c = 0]$$

$$\circ_o \quad f_{be} = -5 \text{ kN (C)} ; f_{fe} = -15 \text{ kN (C)} ; f_{bc} = 18 \text{ kN (T)}$$

**Problem Statement (cont.) :** Determine the force developed in members FE, EB, and BC of the truss and state if these members are in tension or compression “Method of Sections”.

