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THEORY OF STRUCTURES
CHAPTER 4 : TRUSSES (METHOD OF JOINT)
PART 1

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Chapter 4 : Part 1 – Method of Joint

- Aims
  - Determine internal forces in truss member
- Expected Outcomes :
  - Able to analyse trusses using method of joint
- References
  - Mechanics of Materials, R.C. Hibbeler, 7th Edition, Prentice Hall
  - Structural Analysis, Hibbeler, 7th Edition, Prentice Hall
  - Structural Analysis, SI Edition by Aslam Kassimali,Cengage Learning
  - Structural Analysis, Coates, Coatie and Kong
  - Structural Analysis - A Classical and Matrix Approach, Jack C. McCormac and James K. Nelson, Jr., 4th Edition, John Wiley

INTRODUCTION TO TRUSS

- TRUSS – structure composed of slender member joined together at their end points
- Commonly construct consist of wooden struts and metal bars (steel)
- Connection joints – by bolting or welding to gusset plate
  Objective : To determine the reactions and member forces
- Three methods to carry out the analysis of statically determinate trusses
  - Method of Joints
  - Method of Section
  - Unit Load Method

ANALYSIS OF STATICALLY DETERMINATE PLANE TRUSSES USING

PART 1
METHOD OF JOINTS

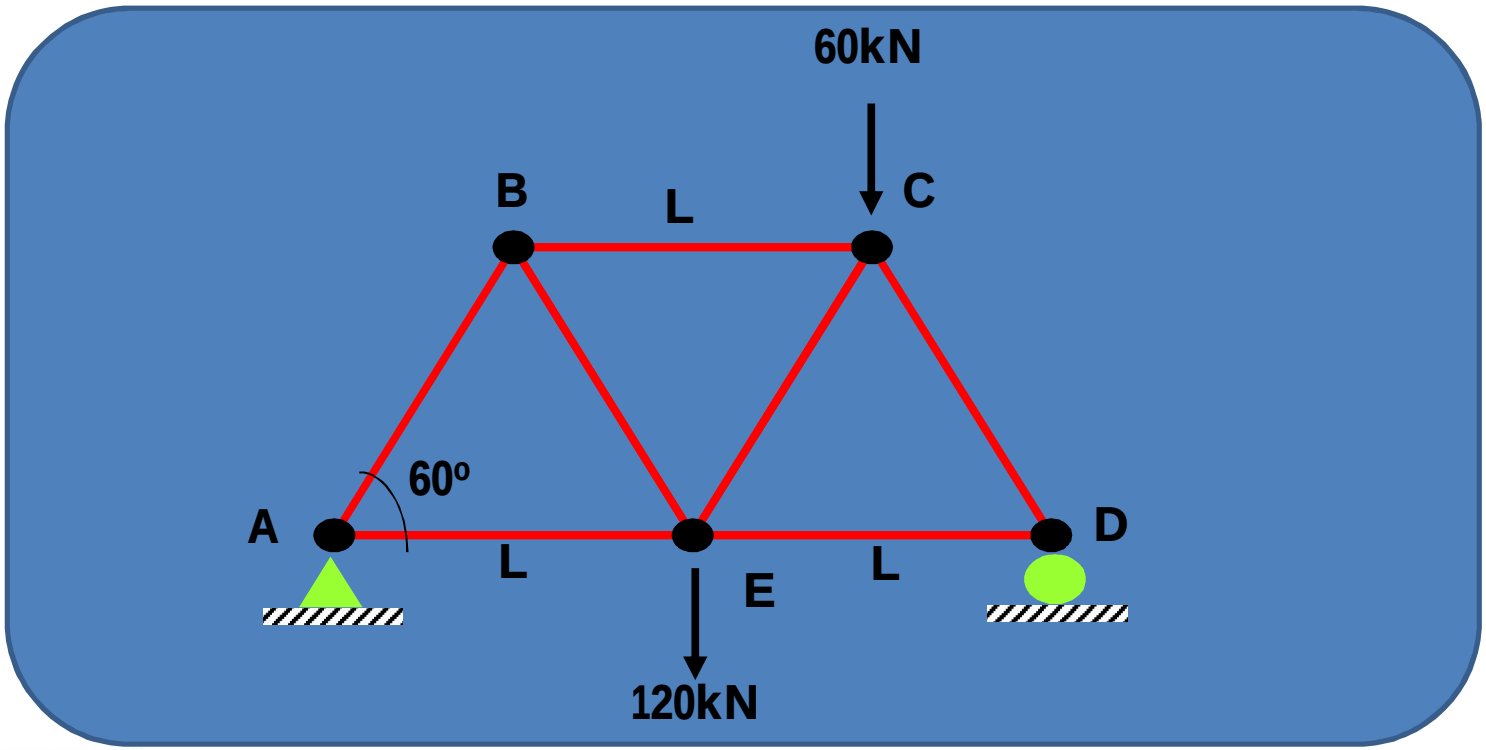
METHOD OF JOINTS

Simple guidelines for analysis:

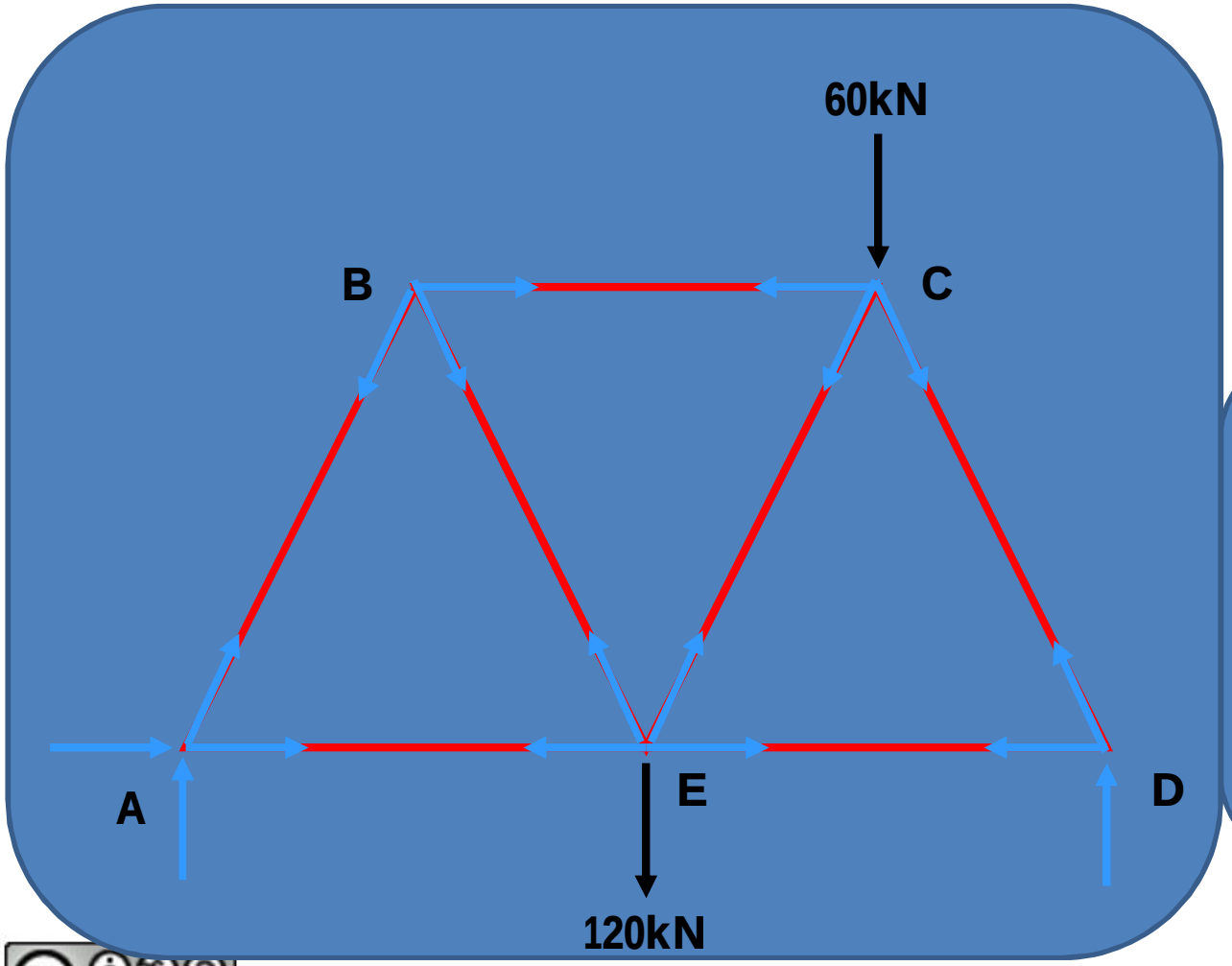
1. Draw the FBD
2. Solve reactions
3. Select joint with minimum number of unknowns
   (preferably only 2 unknowns)
4. Analyze magnitude of forces using equilibrium equation
5. Proceed to other joints, concentrating with joints that has minimum no. of unknowns
6. Check member forces at unused joint/ s
7. Tabulate the value of member forces tension (+) and compression (-)

EXAMPLE 1

Using method of joints, determine the force in each member of the trusses shown (assume L = 1m).



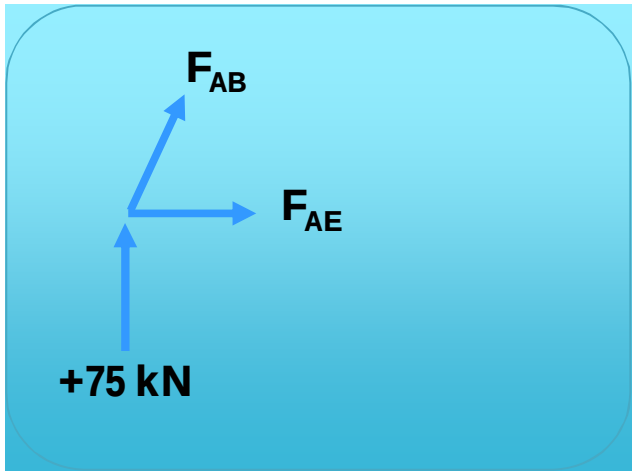
Free Body Diagram (FBD)



Find Reaction:

$R_A = 75$ kN
$R_D = 105$ kN
$H_A = 0$

Joint A



$\sum Fy=0,$

$75 + F_{AB} \sin 60 = 0$

$F_{AB} =$ **-86.6 kN**

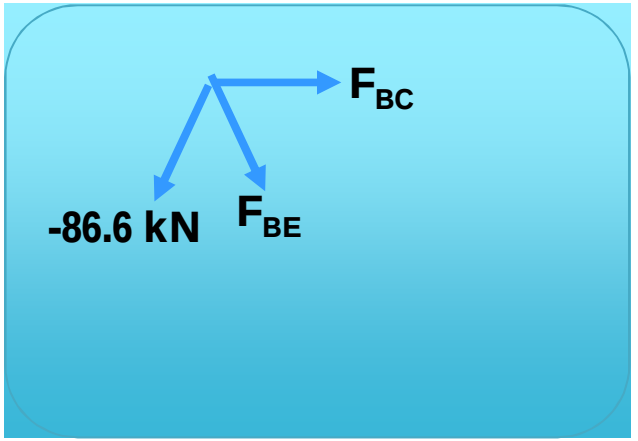
$\sum Fx=0,$

$F_{AE} + F_{AB} \cos 60 = 0$

$F_{AE} + (-86.6) \cos 60 = 0$

$F_{AE} =$ **+43.3 kN**

Joint B



$\sum Fy=0,$

$-F_{BE} \sin 60 - (-86.6 \sin 60) = 0$

$F_{BE} =$ **+86.6 kN**

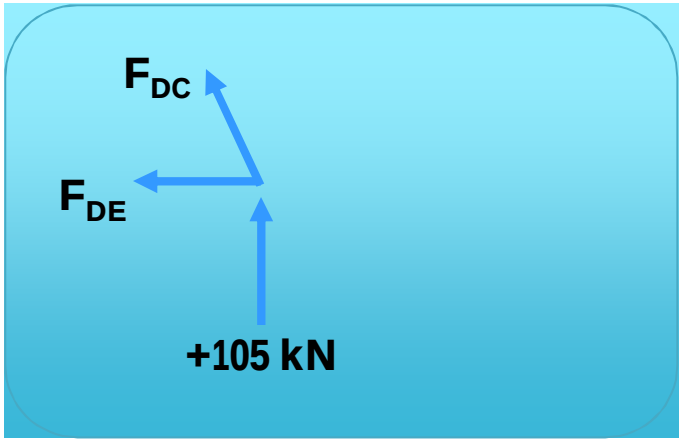
$\sum Fx=0,$

$F_{BC} - (-86.6 \cos 60) + F_{BE} \cos 60 = 0$

$FBC + 86.6 \cos 60 + 86.6 \cos 60 = 0$

$F_{BC} =$ **-86.6kN**

Joint D



$\sum Fy=0,$

$105 + F_{DC} \sin 60 = 0$

$F_{DC} =$ **-121.2 kN**

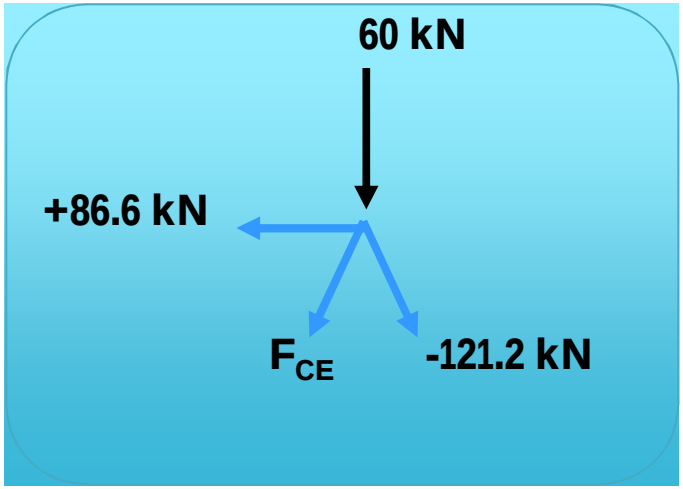
$\sum Fx=0,$

$-F_{DE} - F_{DC} \cos 60 = 0$

$-F_{DE} - (-121.2 \cos 60) = 0$

$F_{DE} =$ **+60.6 kN**

Joint C

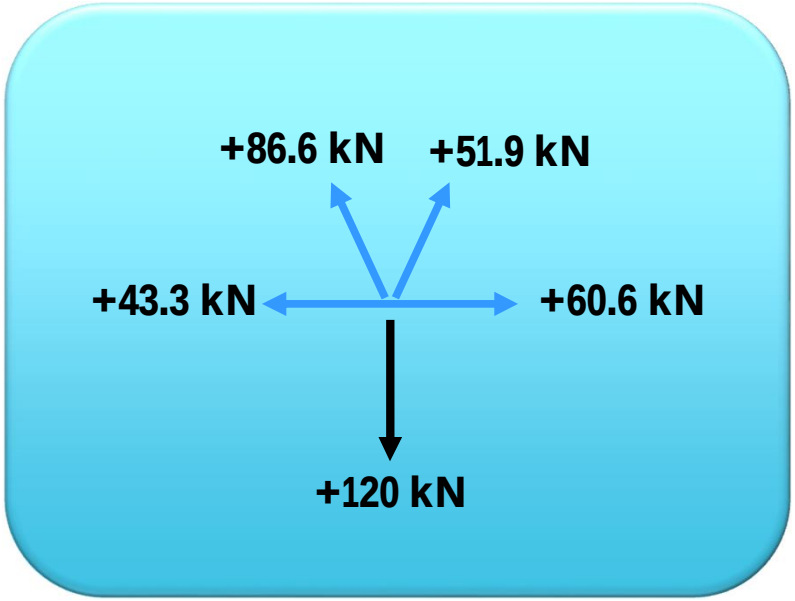


$\sum Fy=0,$

$- 60 - (-121.2 \sin 60) - F_{CE} \sin 60 = 0$

$F_{CE} =$ **+51.9 kN**

Checking at Joint E



$\sum Fx = 0,$

$-43.3 - 86.6 \cos 60 + 51.9 \cos 60 + 60.6 = 0$

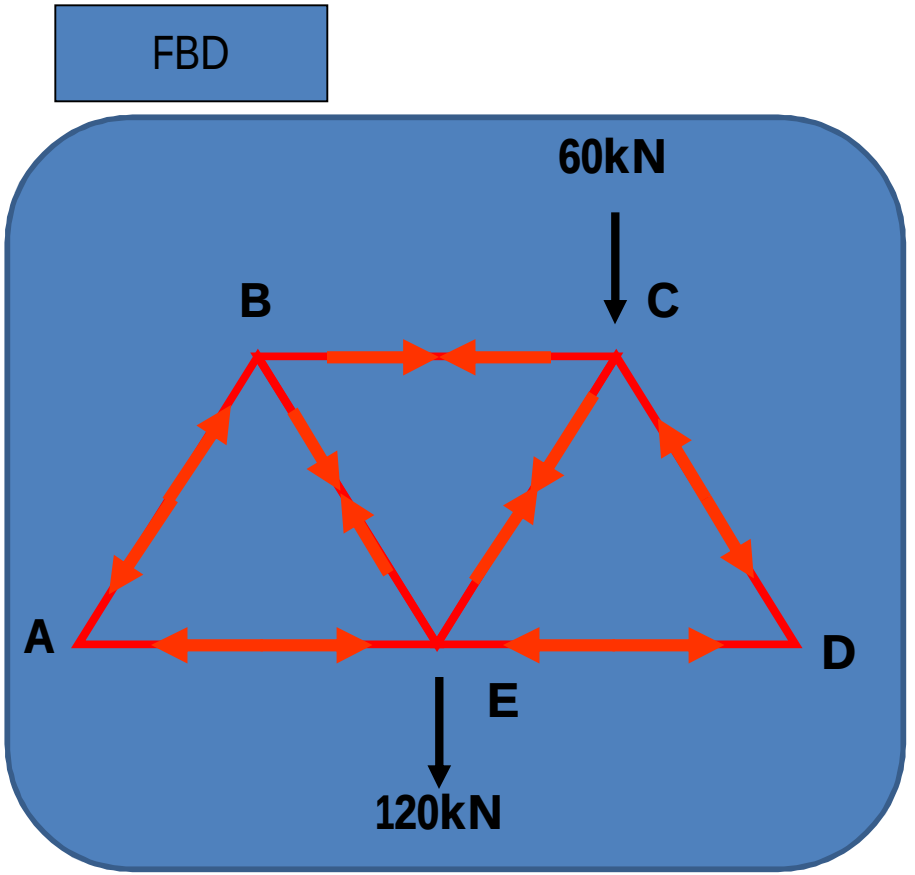
$0 = 0$ ... (OK)

$\sum Fy = 0,$

$-120 + 86.6 \sin 60 + 51.9 \sin 60 = 0$

$0 = 0$ ... (OK)

Member	Force (kN)	Condition
AB	- 86.6	Comp.
BC	-86.6	Comp.
CD	- 121.2	Comp.
DE	+ 60.6	Tension
EA	+ 43.3	Tension
BE	+ 86.6	Tension
CE	+ 51.9	Tension



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