

Taibah University
College of Engineering



Course title:

Structural Analysis

Code: AE 321

Total credit hours = 3

**Pre-requisites: GE201 Statics ;
AE212 Architectural Design (1)**

Lecturer: Dr. Ahmed Kamal

[1]

Internal Loadings Developed in Frame Members

Dr. Ahmed Kamal

AE 321: Structural Analysis Dr. Ahmed Kamal

[2]



A frame is composed of several connected members that are either fixed or pin connected at their ends. The design of these structures often requires drawing the shear and moment diagrams for each of the members.



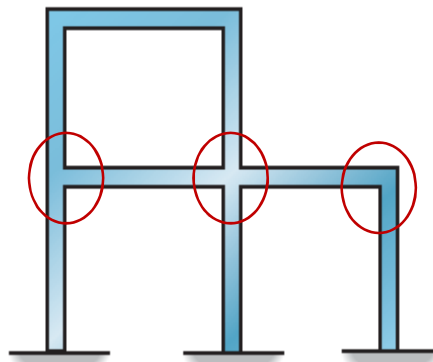
Dr. Ahmed Kamal

AE 321: Structural Analysis Dr. Ahmed Kamal

{ 3 }



In frames, two or more members may meet in one joint. The whole structures and each part of it must be in static equilibrium, i.e., the three condition of equilibrium must be satisfied.



Dr. Ahmed Kamal

AE 321: Structural Analysis Dr. Ahmed Kamal

Method of Frame Analysis

Follow exactly the same rules as in the case of beams.

{ 4 }



Procedure for Analysis

1. Determine the support reactions.
2. The diagrams of internal forces (normal, shear, and bending moment) are drawn on a datum having the same shape as the frame.
3. When calculating an internal force at a section, the frame must be cut into two parts at that section.
4. It is advised to draw the B.M.D. on the tension side of each member. Each member is looked at from the inside of the frame.

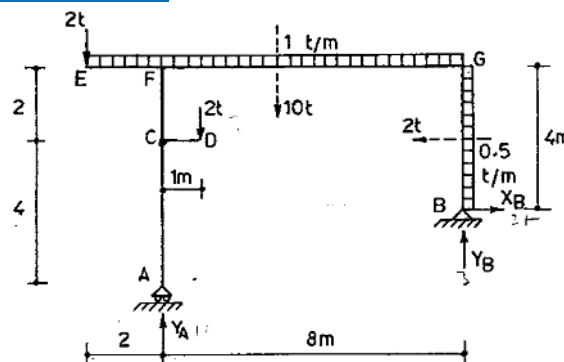
Dr. Ahmed Kamal

Dr. Ahmed Kamal
Structural Analysis
AE 321:

{ 5 }



SAMPLE PROBLEM (1)



$$\Sigma M_B = 0, \quad \therefore 2 \times 2 + 10 \times 5 + 2 \times 7 + 2 \times 10 - 8 Y_A = 0$$

$$\therefore Y_A = 11 \text{ t } \uparrow$$

$$\Sigma Y = 0, \quad \therefore 10 + 2 + 2 - 11 - Y_B = 0$$

$$\therefore Y_B = 3 \text{ t } \uparrow$$

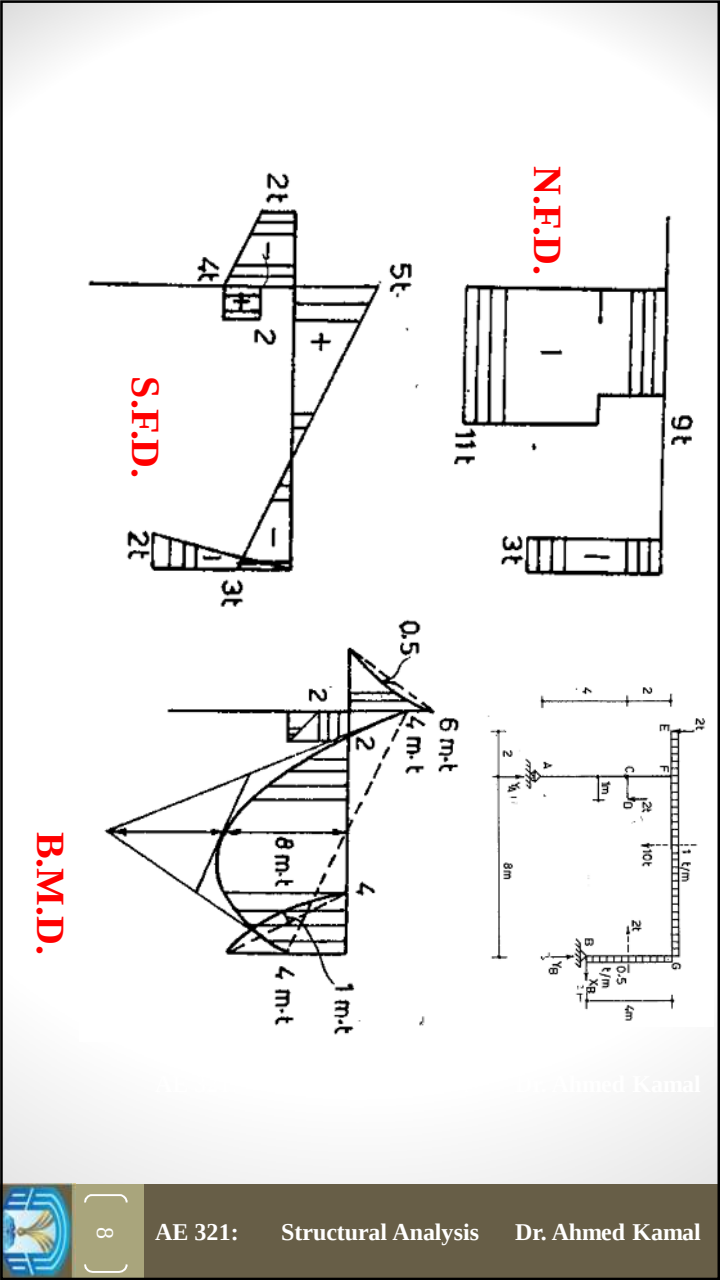
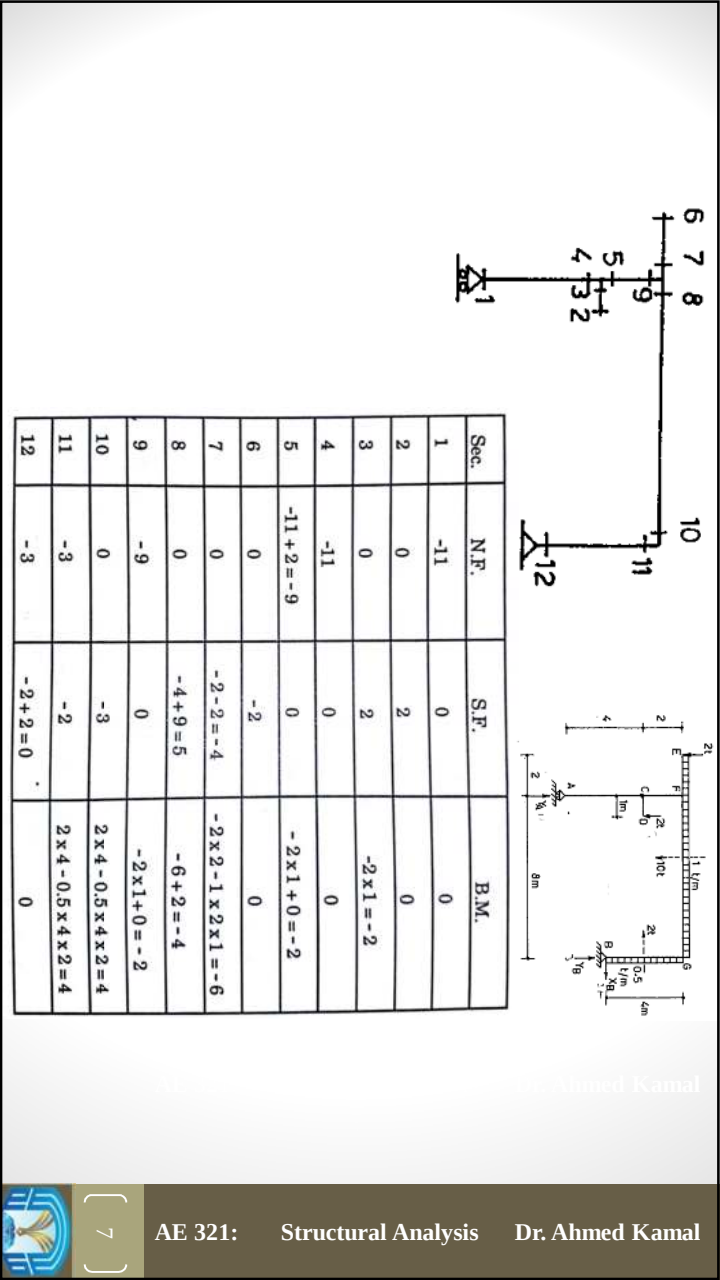
$$\Sigma X = 0, \quad X_B = 2 \text{ t } \rightarrow$$

Dr. Ahmed Kamal

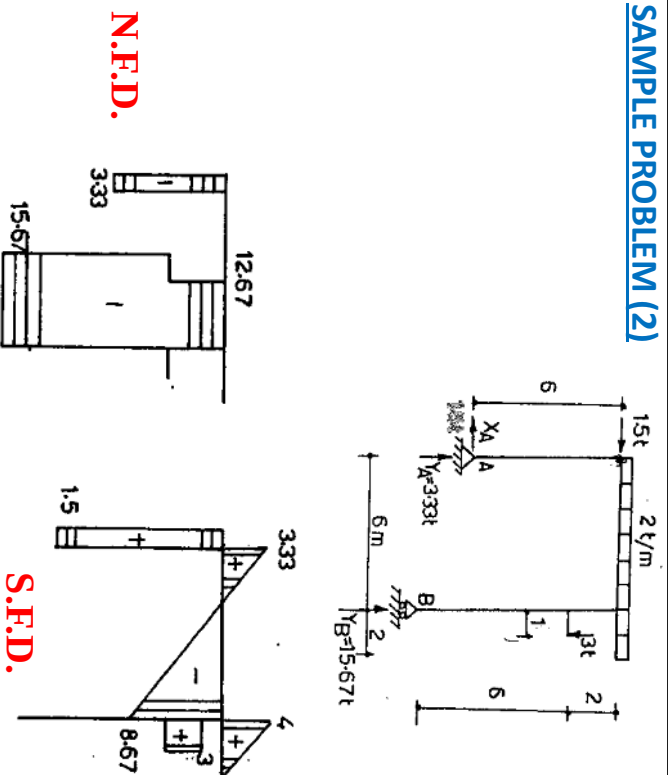
Dr. Ahmed Kamal
Structural Analysis
AE 321:

{ 6 }



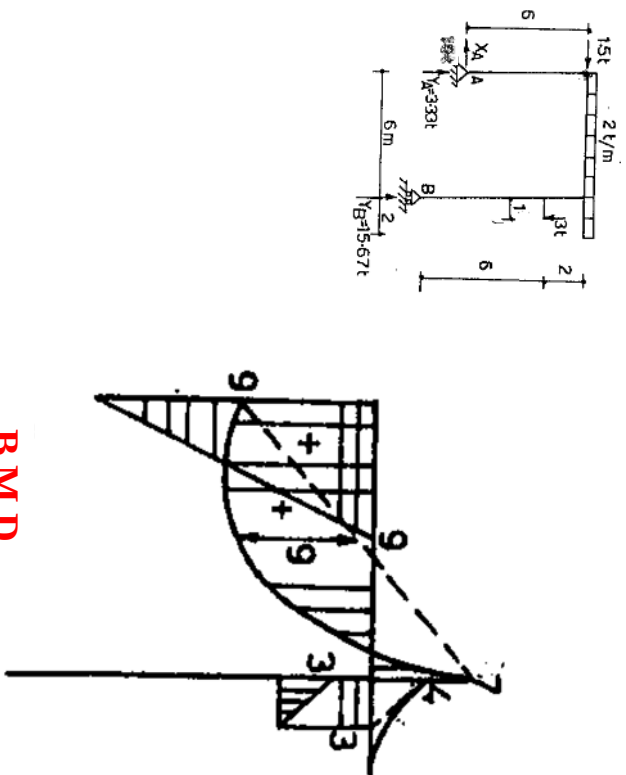


SAMPLE PROBLEM (2)



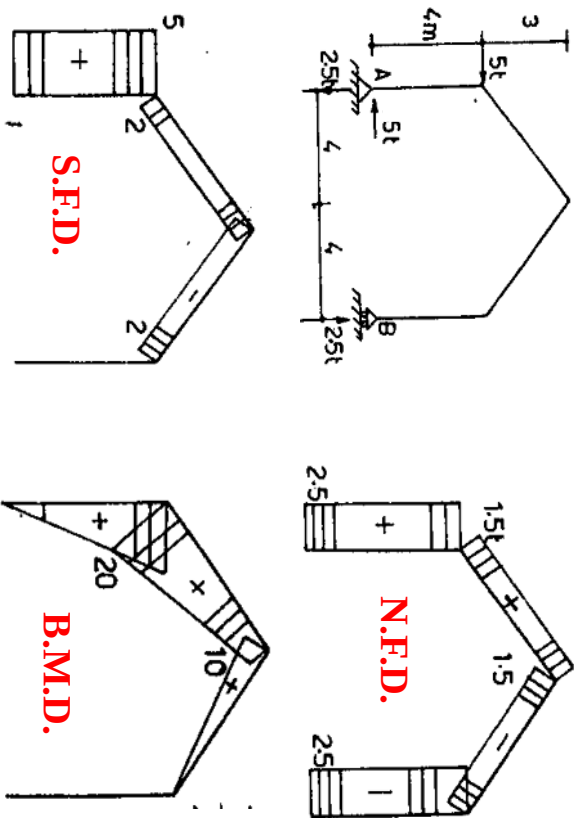
N.F.D.

S.F.D.



B.M.D.

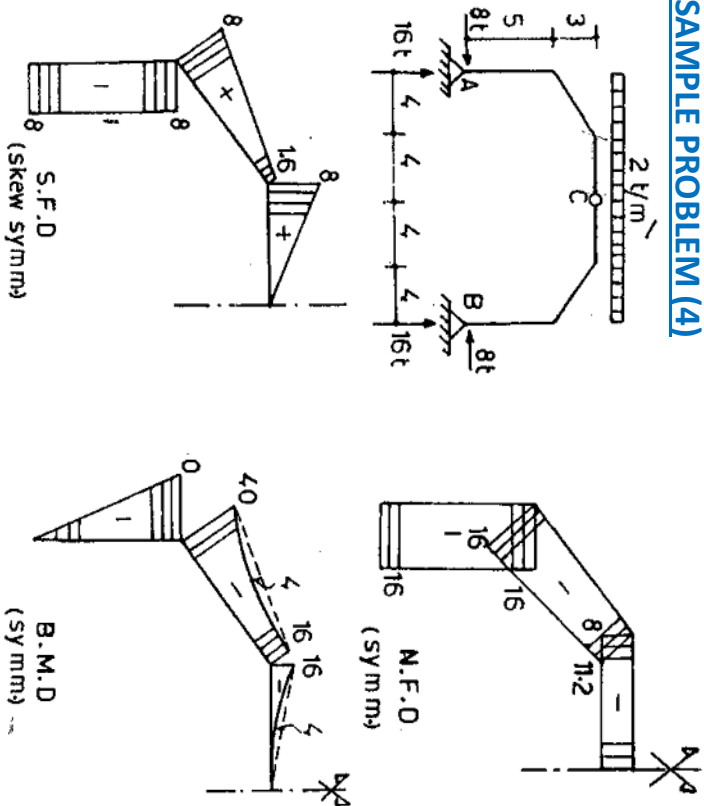
SAMPLE PROBLEM (3)



[11]

AE 321: Structural Analysis Dr. Ahmed Kamal

SAMPLE PROBLEM (4)



[12]

AE 321: Structural Analysis Dr. Ahmed Kamal

