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

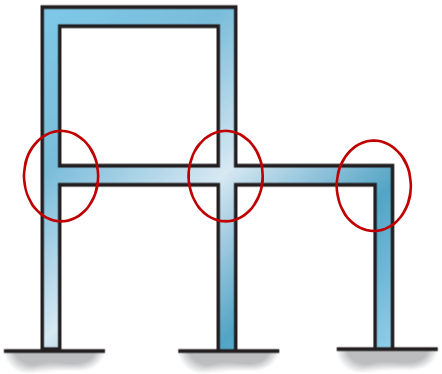
1

Internal Loadings Developed in Fame Members

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.

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.



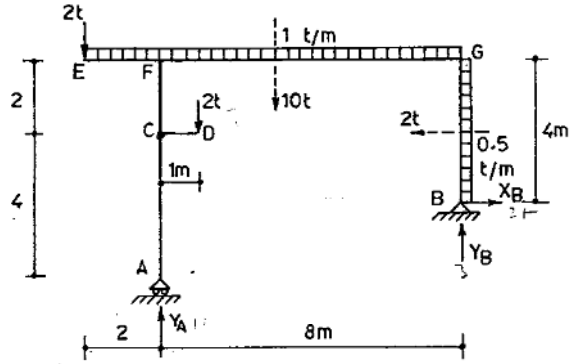
Method of Frame Analysis

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

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.

SAMPLE PROBLEM (1)



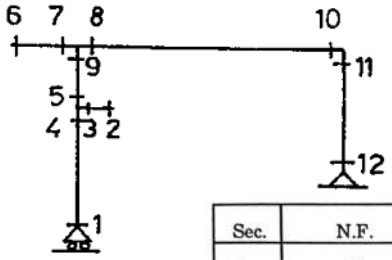
$\Sigma M_B = 0, \quad \therefore 2x2 + 10 \times 5 + 2x7 + 2 \times 10 - 8\,Y_A = 0$

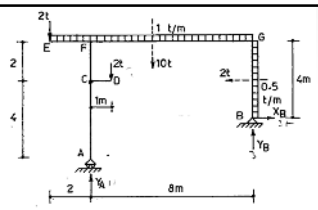
$\therefore Y_A = 11\ t \uparrow$

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

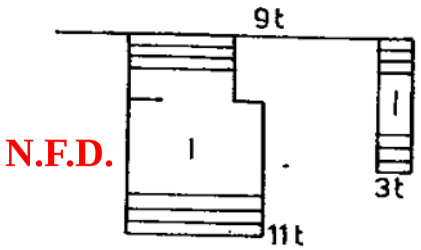
$\therefore Y_B = 3\ t \uparrow$

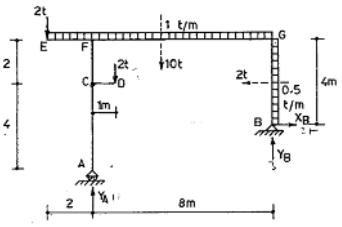
$\Sigma X = 0, \quad X_B = 2\ t \rightarrow$

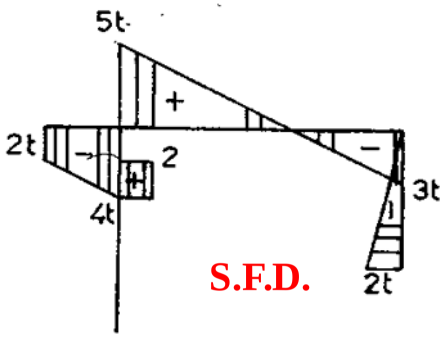


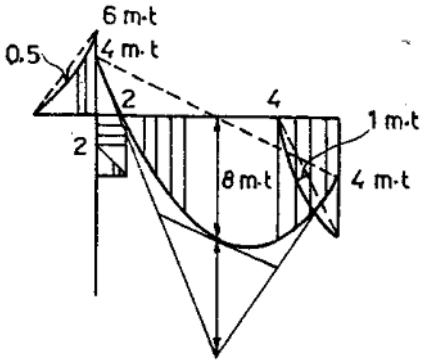


Sec.	N.F.	S.F.	B.M.
1	-11	0	0
2	0	2	0
3	0	2	-2 x 1 = -2
4	-11	0	0
5	-11 + 2 = -9	0	- 2 x 1 + 0 = -2
6	0	-2	0
7	0	-2 - 2 = -4	- 2 x 2 - 1 x 2 x 1 = -6
8	0	-4 + 9 = 5	-6 + 2 = -4
9	-9	0	- 2 x 1 + 0 = - 2
10	0	-3	2 x 4 - 0.5 x 4 x 2 = 4
11	-3	-2	2 x 4 - 0.5 x 4 x 2 = 4
12	-3	-2 + 2 = 0	0

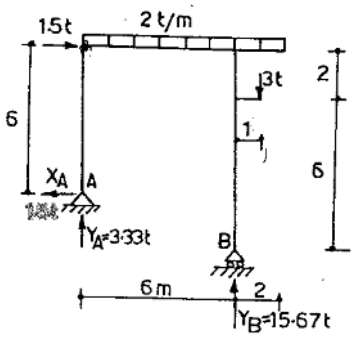


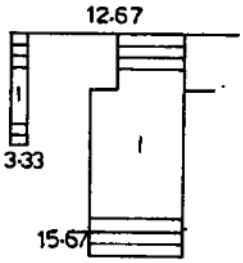






SAMPLE PROBLEM (2)





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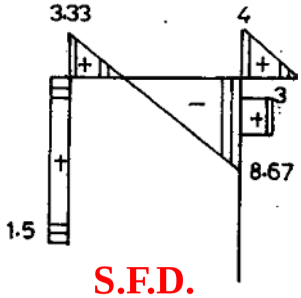
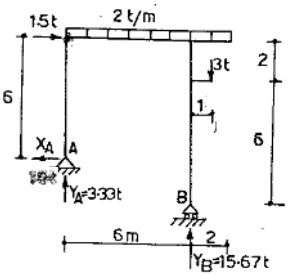
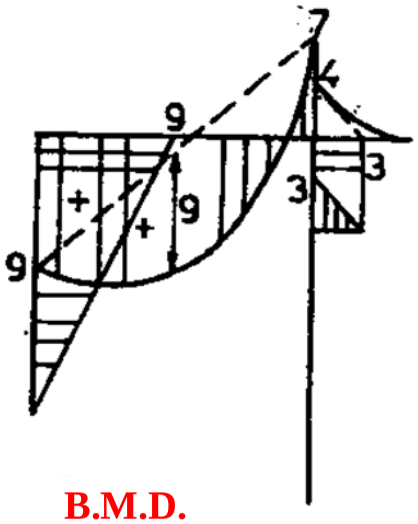


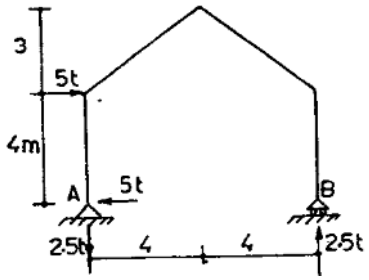
S.F.D.

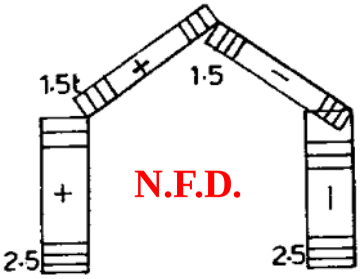


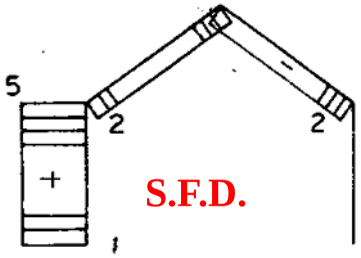


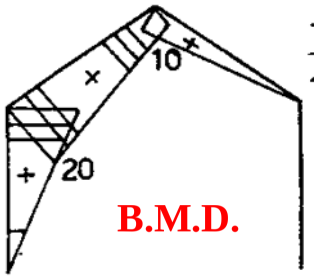
B.M.D.

SAMPLE PROBLEM (3)

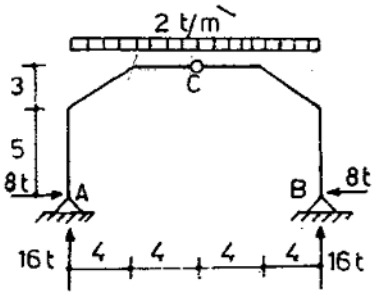


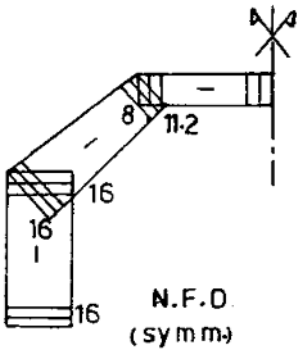


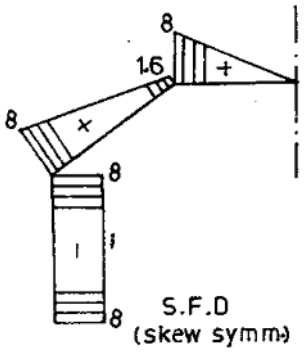


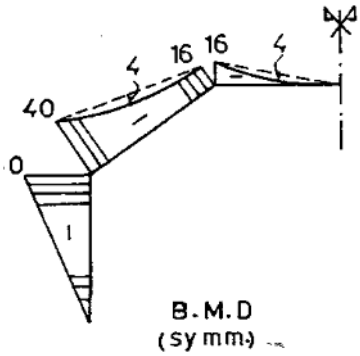


SAMPLE PROBLEM (4)










Thank you
AE 321: Structural Analysis Dr. Ahmed Kamal
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