EWCE-311

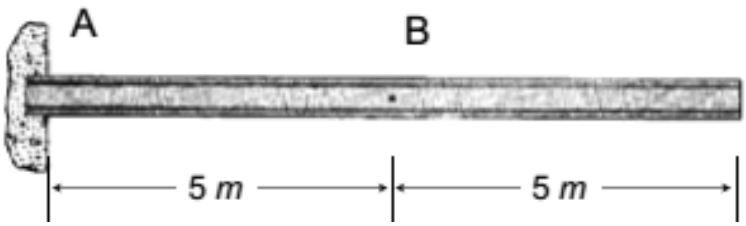
Structural Analysis And Design-I

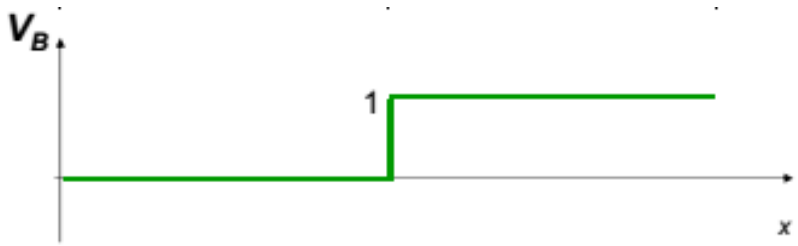
Practice examples of influence line of beam and frame

Instructor: Dr. Noor Md. Sadiqul Hasan

Recap of Influence Line of Beam

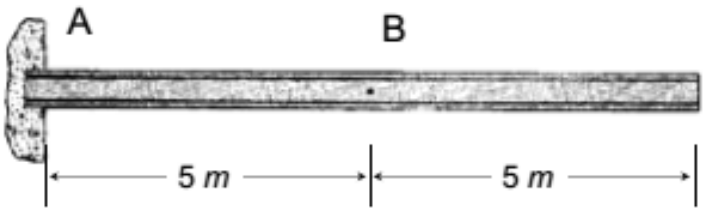
Example: Construct the ***influence line*** for the shear at point B

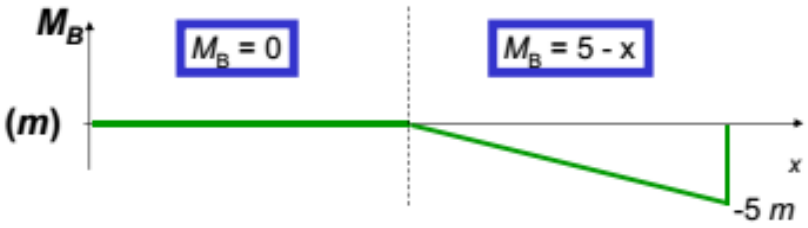




Recap of Influence Line of Beam

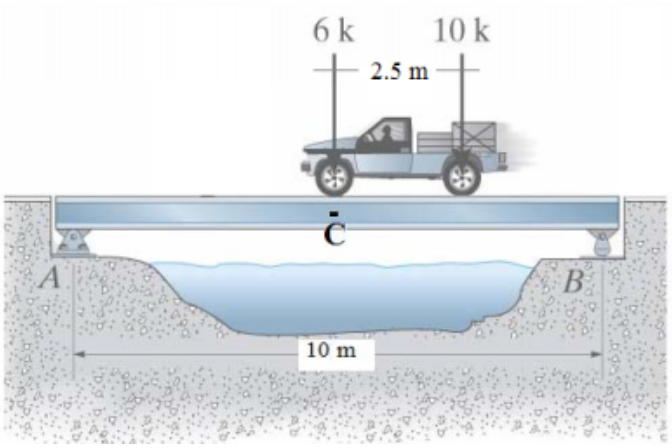
Example: Construct the ***influence line*** for the bending moment at point B

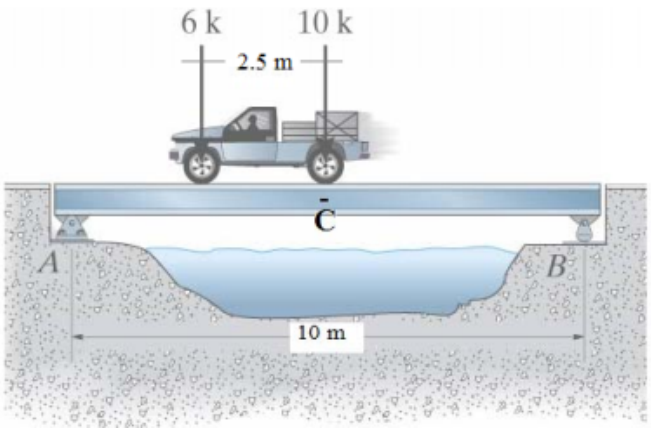




Practical Applications of Influence Line of Beam

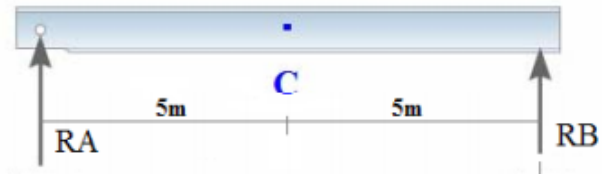
Determine the moment at C in the cases

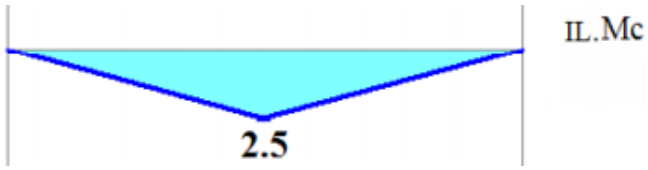


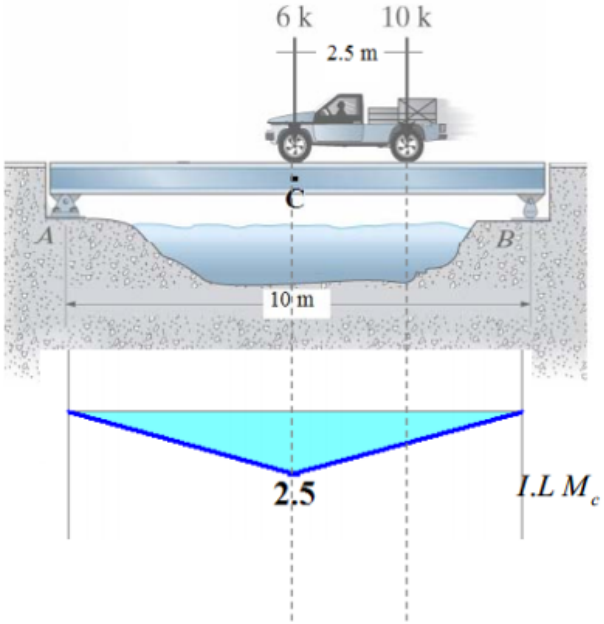


Practical Applications of Influence Line of Beam

Draw IL for MC for case 1:



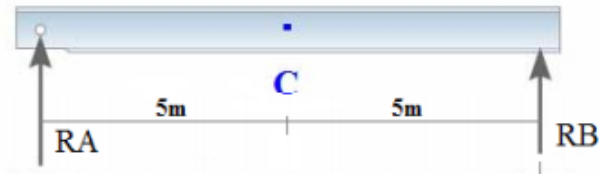


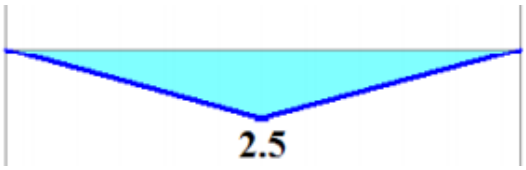


$$M_c = 6(2.5) + 10(1.25) = 27.5\ kN.m$$

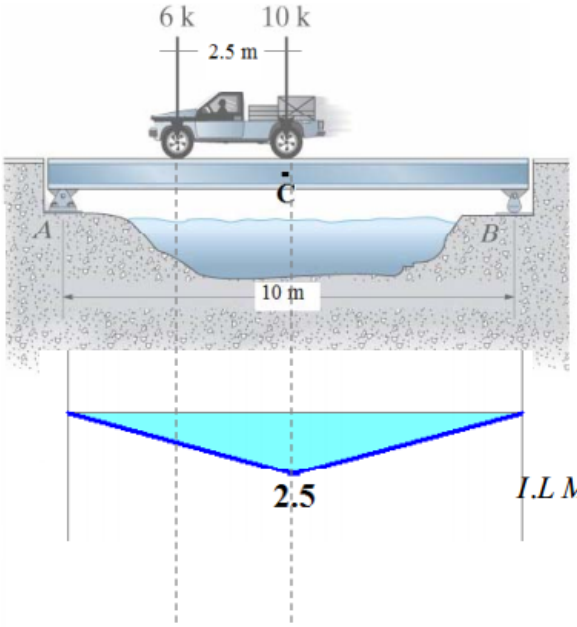
Practical Applications of Influence Line of Beam

Draw IL for MC for case 2:





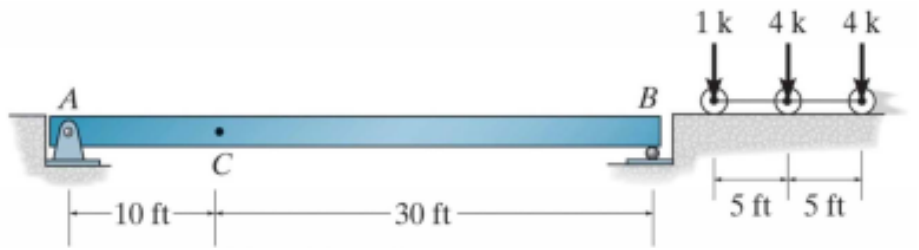
IL.Mc



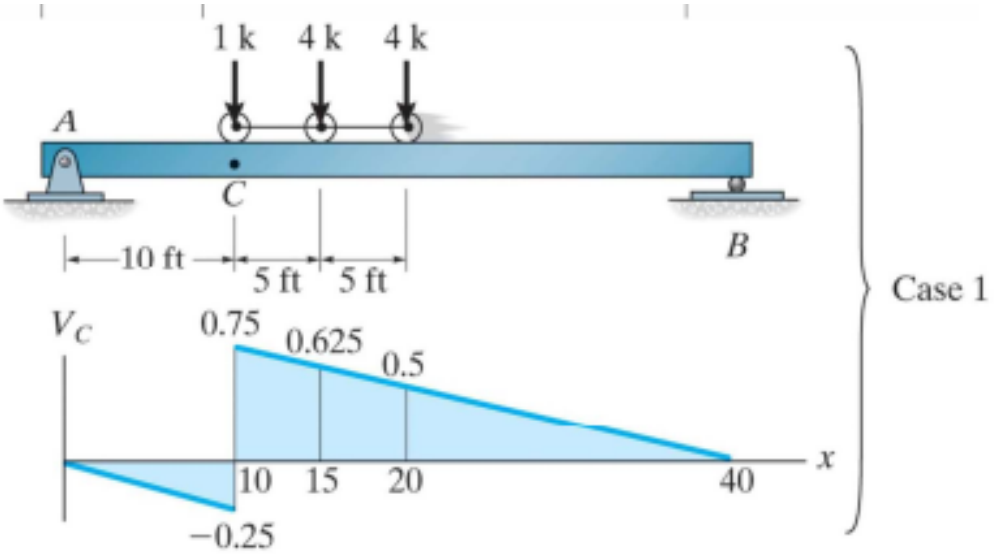
$M_c = 6(1.25) + 10(2.5) = 32.5\ kN.m$

Influence Line due to Series of Concentrated Loads

Determine the shear at C in the cases

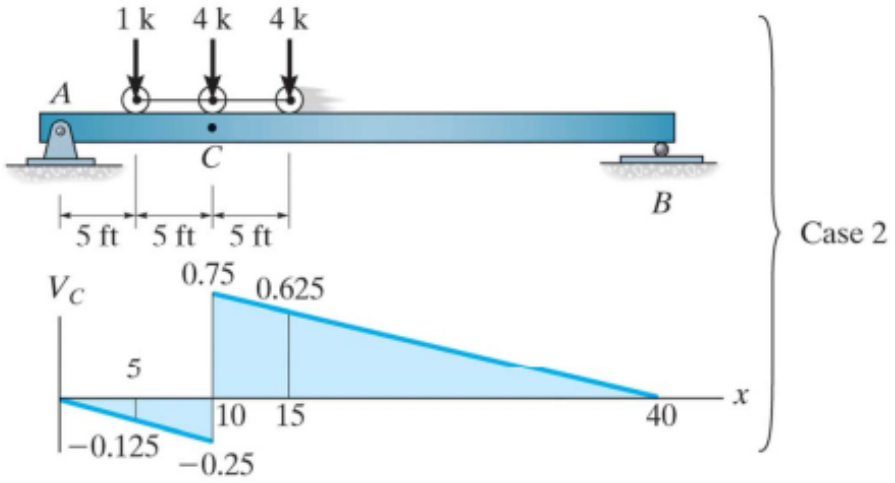


Influence Line due to Series of Concentrated Loads



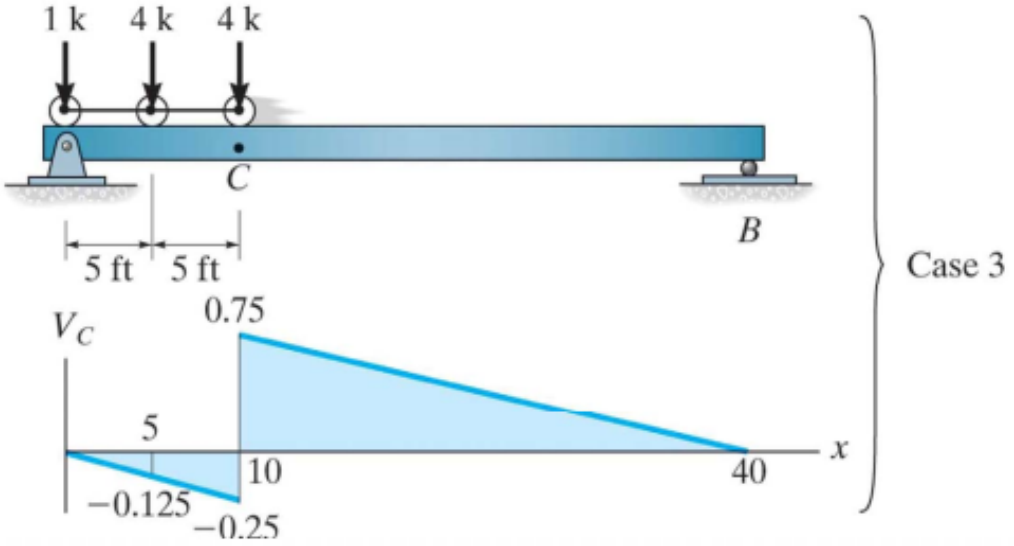
$$(V_C)_1 = 1(0.75) + 4(0.625) + 4(0.5) = 5.25k$$

Influence Line due to Series of Concentrated Loads



$$(V_C)_2 = 1(-0.125) + 4(0.75) + 4(0.625) = 5.375k$$

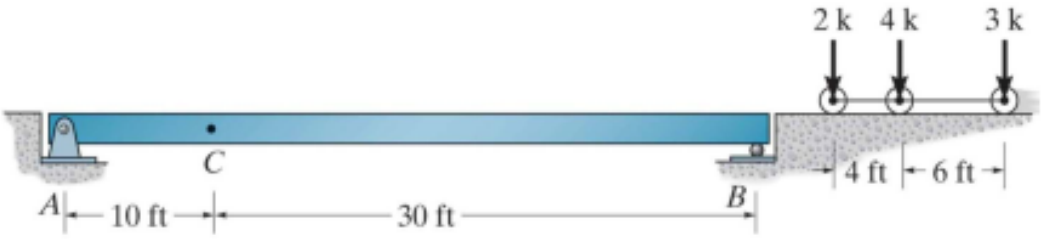
Influence Line due to Series of Concentrated Loads

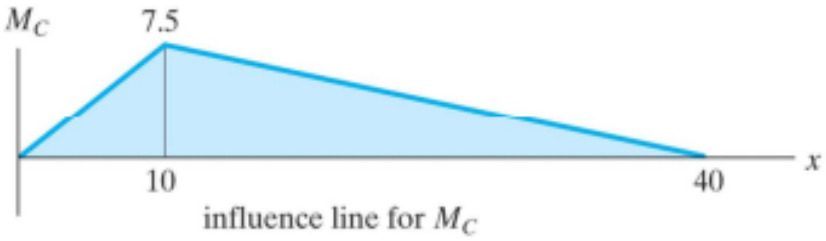


$$(V_C)_3 = 1(0) + 4(-0.125) + 4(0.75) = 2.5k$$

Influence Line due to Series of Concentrated Loads

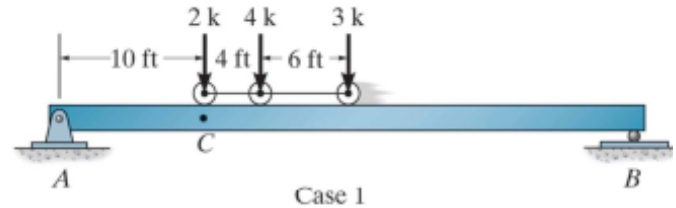
Determine the moment at C in the cases



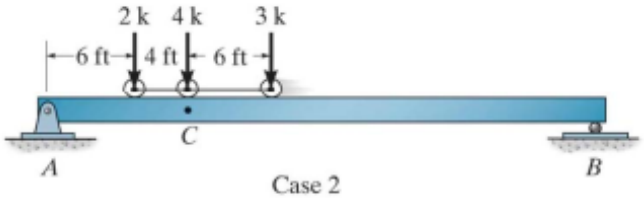


influence line for M_C

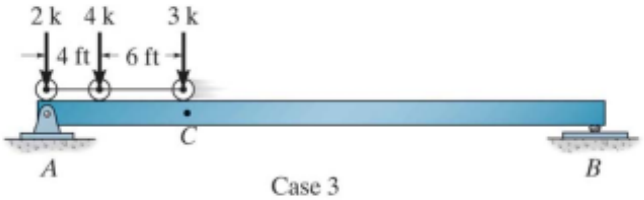
Influence Line due to Series of Concentrated Loads



Case 1



Case 2



Case 3

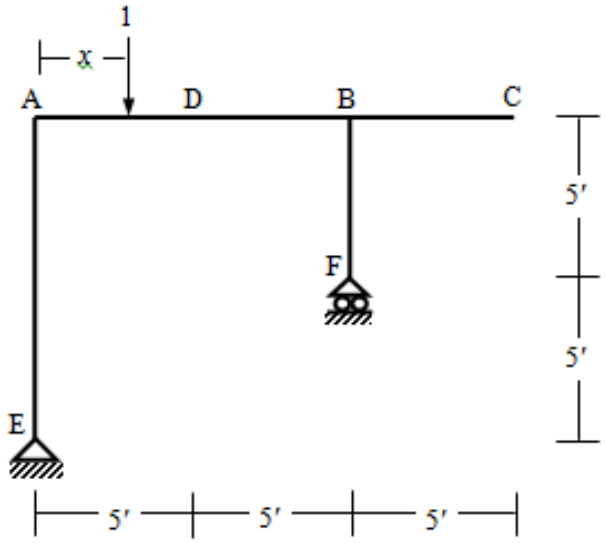
$$(M_C)_1 = 2(7.5) + 4(6.5) + 3(5.0) = 56.0\,k\,ft$$

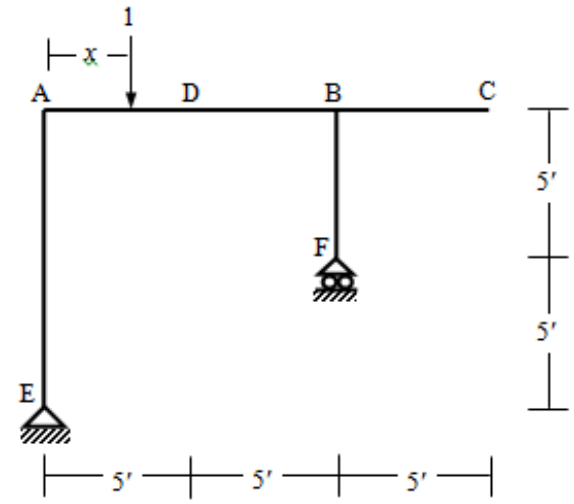
$$(M_C)_2 = 2(4.5) + 4(7.5) + 3(6.0) = 57.0\,k\,ft$$

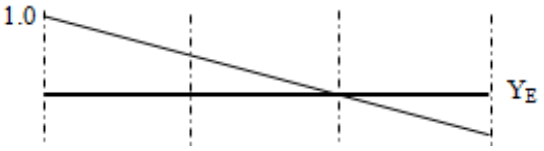
$$(M_C)_3 = 2(0) + 4(3.0) + 3(7.5) = 34.5\,k\,ft$$

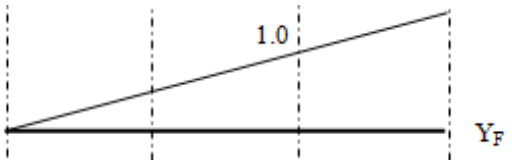
Influence Line of Frame

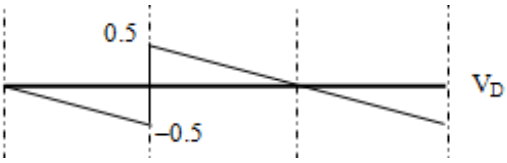
For the frame shown below, draw the influence lines for (i) YE, YF, (ii) VD, VB(AC)R, (iii) MD, MB(AC), if the unit load moves over (a) beam AC, (b) column EA.

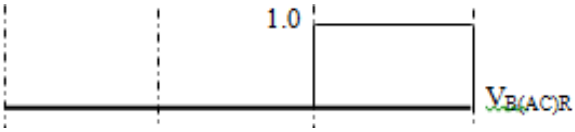


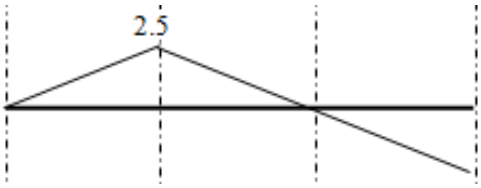

1
x
A
D
B
C
5′
F
5′
E
5′
5′
5′

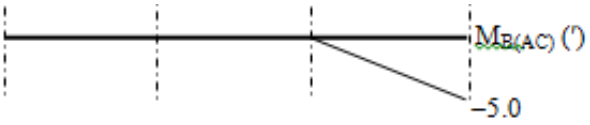

1.0
Y_E

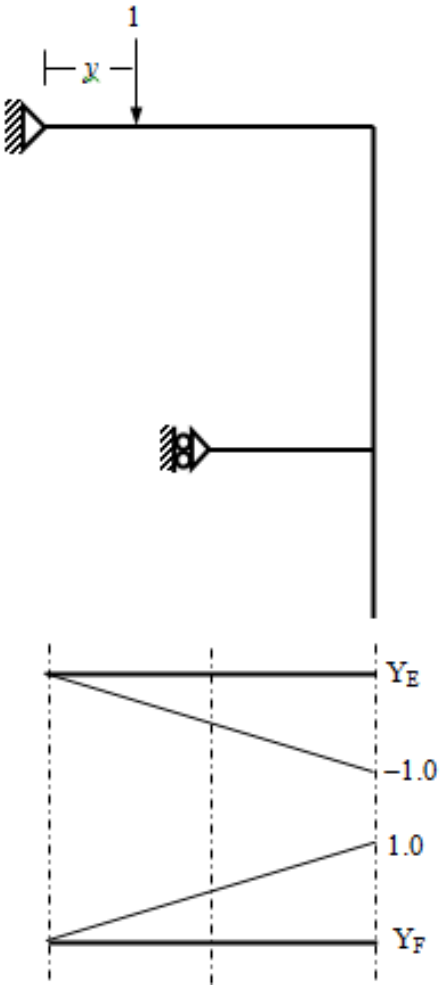

1.0
Y_F

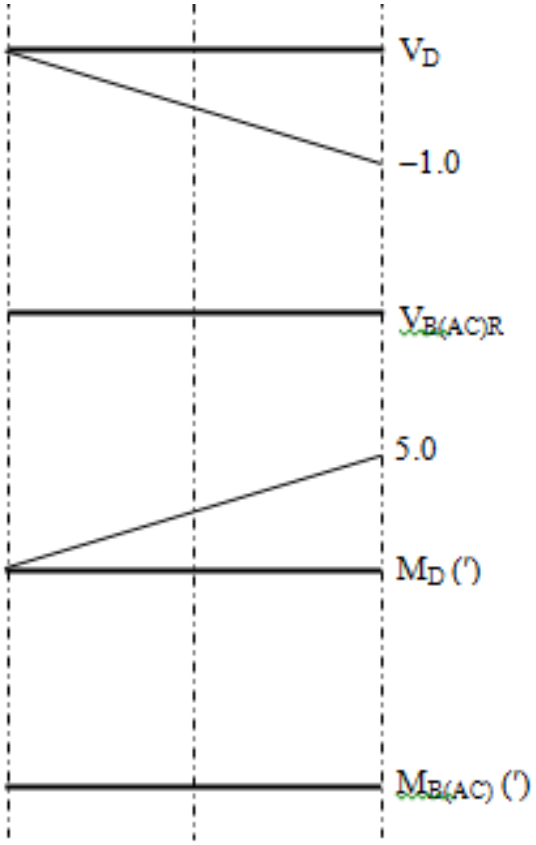

0.5
−0.5
V_D


1.0
$V_{B(AC)R}$


2.5
M_D (′)

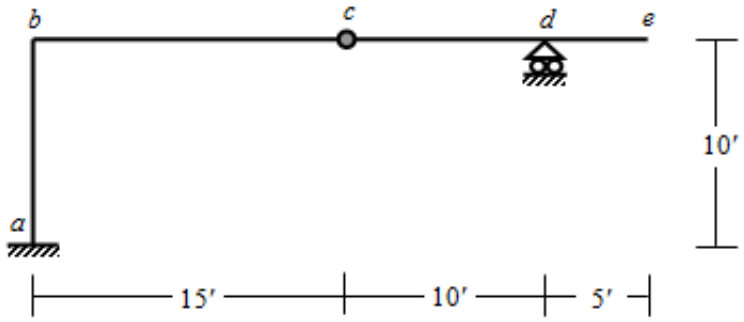

$M_{B(AC)}$ (′)
−5.0


1
x
Y_E
−1.0
1.0
Y_F


V_D
−1.0
$V_{B(AC)R}$
5.0
M_D (')
$M_{B(AC)}$ (')

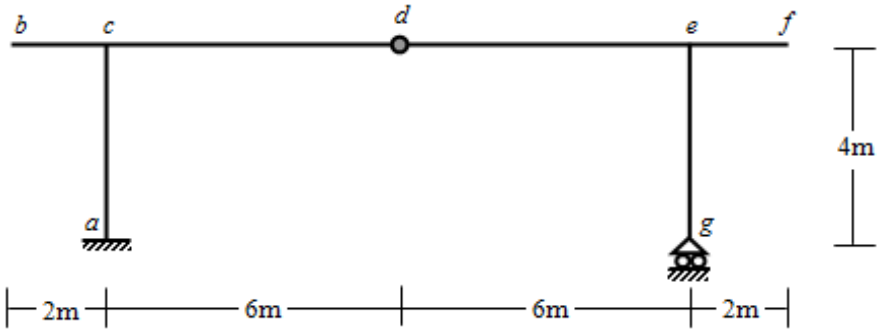
Recap of Influence Line of Frames

1. draw the influence lines of X*a*, Y*a*, V*c*, M*a* and M*b*(*be*), if the unit load moves over (i) beam *be*, (ii) column *ab*.



c is an Internal Hinge

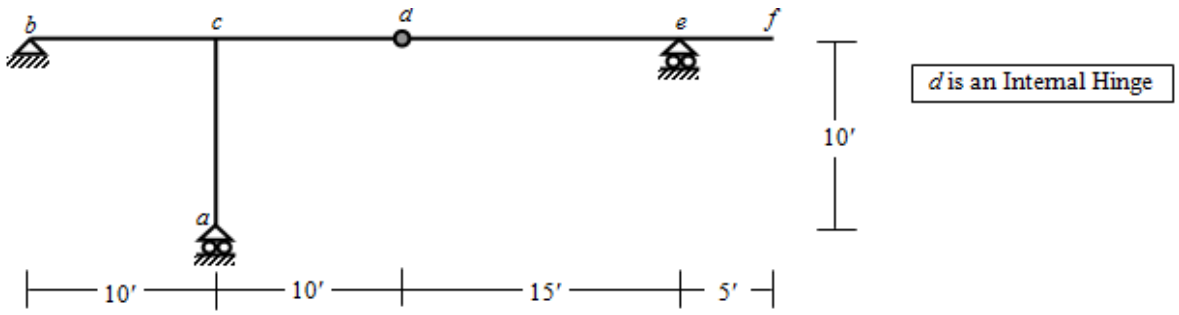
2. Draw the influence lines of X*a*, Y*a*, V*e*(L), M*a* and M*c*(*ac*), if the unit load moves over (i) beam *bf*, (ii) column *eg*.



d is an Internal Hinge

Recap of Influence Line of Frames

3. Draw the influence lines of Y*a*, X*b*, V*c*(R) and M*c*(*bf*), if the unit load moves over (i) beam *bf*, (ii) column *ac*.



4. Draw the influence lines of X*f*, Y*b*, V*d* and M*c*(*ac*), if the unit load moves over (i) beam *bf*, (ii) column *ac*

