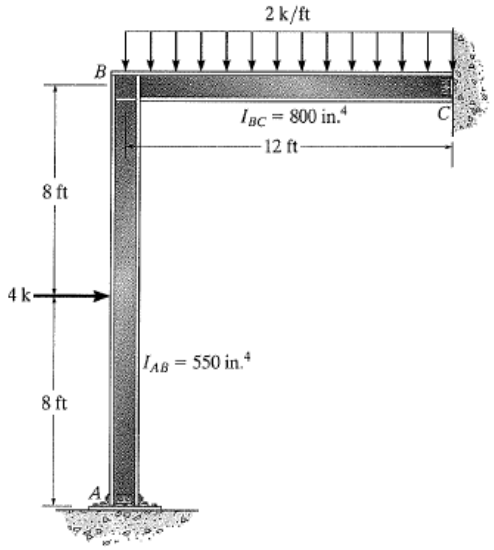
CE371 Structural Analysis I – Moment Distribution Method examples

Example 1:

Using the moment-distribution method, determine the moments at the ends of each member. Draw the moment diagram. Let *E* = 29,000 ksi. The moment of inertia of each member is shown on the figure above. Assume the joint at *B* is rigid, *C* is pinned, and *A* is fixed.



$K_{AB} = 4EI_{AB}/16$ $\quad$ $D.F._{AB} = 0$

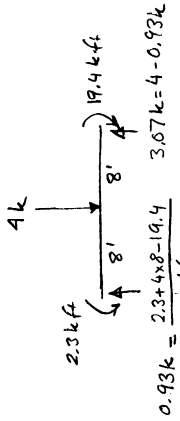
$K_{BA} = 4EI_{AB}/16$ $\quad$ $D.F._{BA} = 0.407$

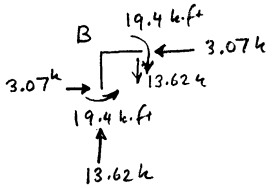
$K_{BC} = 3EI_{BC}/12$ $\quad$ $D.F._{BC} = 0.593$

$K_{CB} = 3EI_{BC}/12$ $\quad$ $D.F._{CB} = 1$

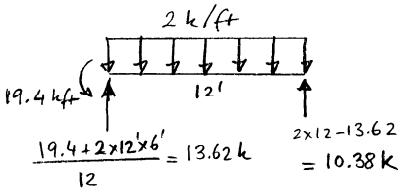
	Jnt A	Jnt B		Jnt C
	AB	**BA**	**BC**	**CB**
D.F.	0.0	0.407	0.593	–
FEM	-8.0	8.0	-36.0	0.0
Imbalance		**-28.0**		
Distribution		11.4	16.6	
Carry-over	5.7			
Resultant moments	**-2.3**	**19.4**	**-19.4**	**0.0**

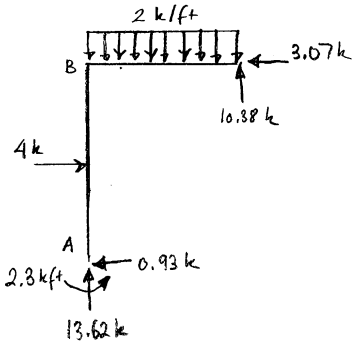
FBD AB:

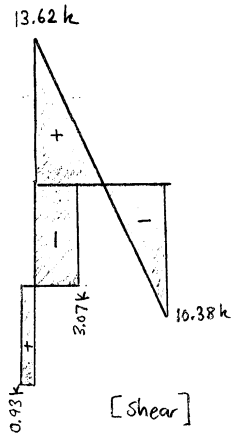




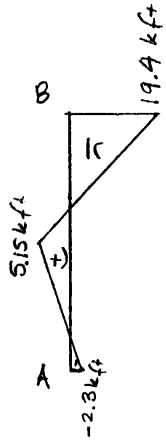
FBD BC:

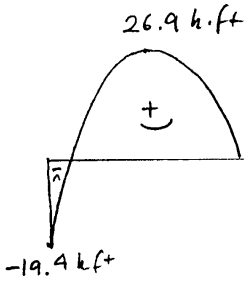




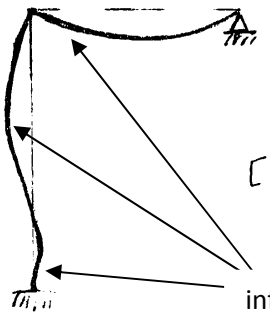


[Shear]





[moment]

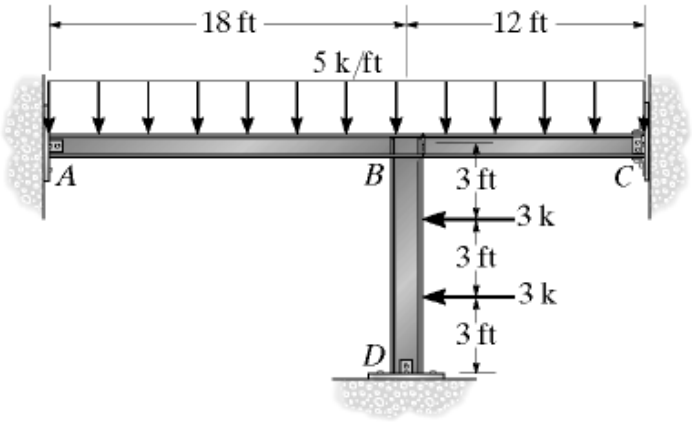


[deflected shape]
not to scale

inflection points

Example 2.

Using the moment-distribution method, determine the moments acting at the ends of each member. Draw the moment diagram. Assume joints *A* and *D* are pin supported and *C* is rigid. Joint *B* is a rigid joint. Let *E* = 29,000 ksi. The moment of inertia are I_{ABC} = 700 in^4 and I_{BD} = 1100 in^4.



$K_{AB} = 3EI_{AB}/18$ $\quad$ $D.F._{AB} = 1$

$K_{BA} = 3EI_{AB}/18$ $\quad$ $D.F._{BA} = 0.163$

$K_{BC} = 4EI_{BC}/12$ $\quad$ $D.F._{BC} = 0.326$

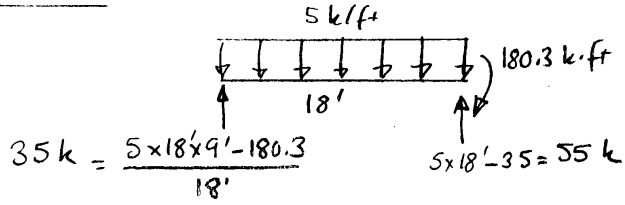
$K_{BD} = 3EI_{BD}/9$ $\quad$ $D.F._{BD} = 0.512$

$K_{CB} = 4EI_{CD}/12$ $\quad$ $D.F._{CB} = 0.000$

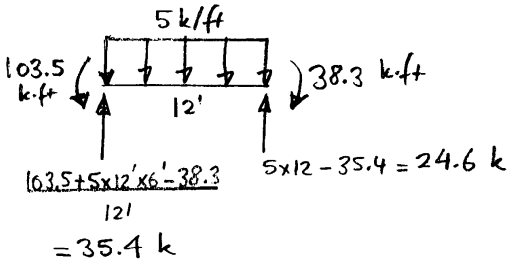
$K_{DB} = 3EI_{BD}/9$ $\quad$ $D.F._{DB} = 1.000$

	Jnt A		Jnt B		Jnt C	Jnt D
Member end	**AB**	**BA**	**BC**	**BD**	**CB**	**DB**
D.F.	1.0	0.163	0.326	0.512	0.000	1.0
FEM	0.0	202.5	-60.0	-9.0	60.0	0.0
Imbalance			**133.5**			
Distribution		-21.7	-43.5	-68.3		
Carry-over					-21.7	
Resultant moments	**0.0**	**180.8**	**-103.5**	**-77.3**	**38.3**	**0.0**

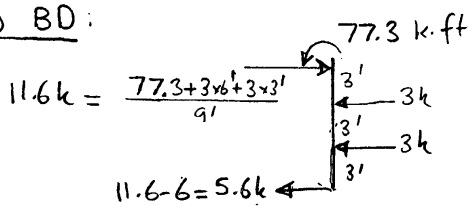
FBD AB:

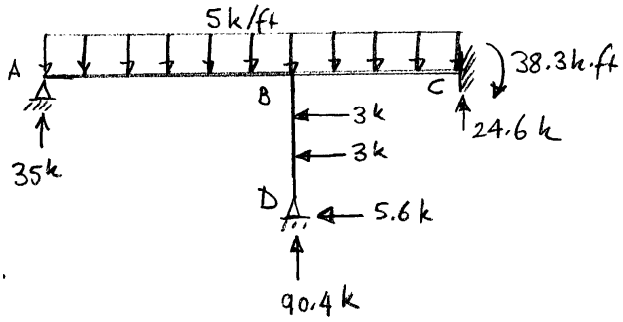


FBD BC:

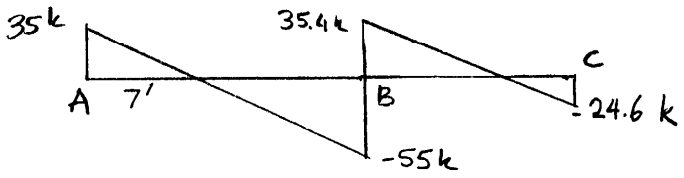


FBD BD:

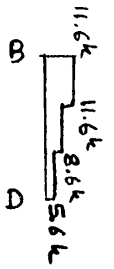


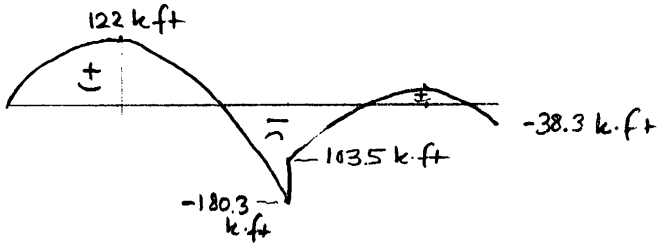


* Round-offs exist.
* Assumed node B is not displacing horizontally or vertically.
* Note that A_x, C_x, D_x depend on whether or not B moves, and the relative stiffness of the members.

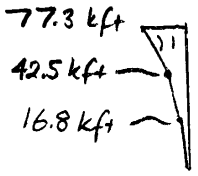


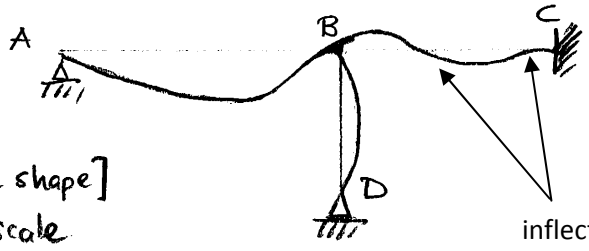
[Shear]





[moment]





[displaced shape]
not to scale

inflection points