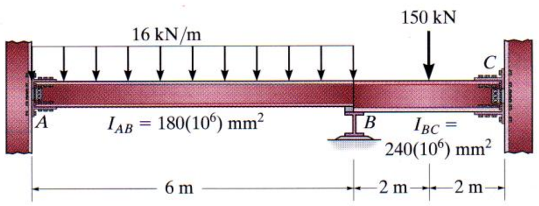
CE 383 STRUCTURAL ANALYSIS
2012 Spring Semester

Problem Set # 3

Solve all questions by using the “Slope Deflection Method”.

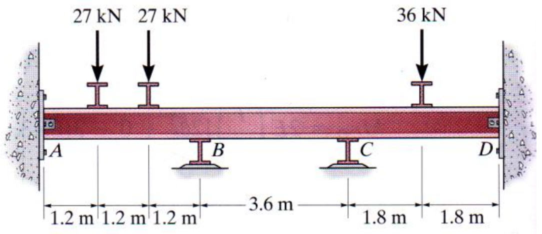
Q.1. (Hibbeler, 6th edition, P11-3)

Determine the moments at *A*, *B*, and *C*, then draw the moment diagram for the beam. The moment of inertia of each span is indicated in the figure. Assume the support at B is roller and A and C are fixed. *E= 200 GPa.*



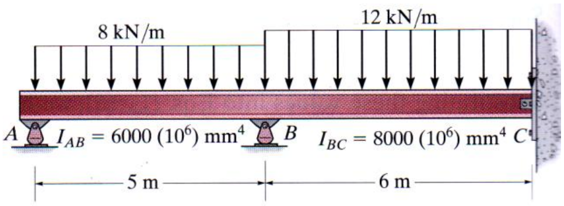
Q.2. (Hibbeler, 6th edition, P11-4)

Determine the reactions at the supports, then draw the moment diagram. Assume A and D are pins and B and C are rollers. The support at B settles 9 mm. Take E= 200 GPa and I= 1800(10^6) mm^4.



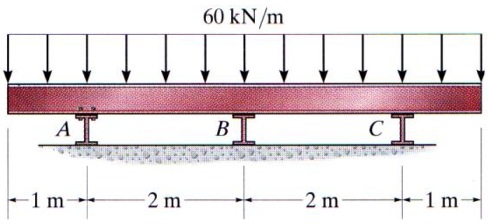
Q.3. (Hibbeler, 6th edition, P11-6)

Determine the internal moment in the beam at B, then draw the moment diagram. Assume A and B are rockers and C is a pin.



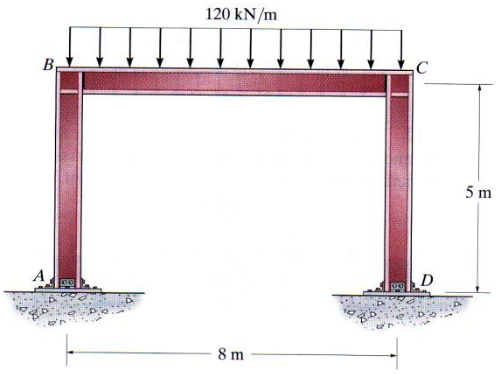
Q.4. (Hibbeler, 6th edition, P11-12)

Determine the internal moments at the supports *A*, *B*, and *C*, then draw the moment diagram. Assume *A* is pinned, and *B* and *C* are rollers. *EI* is constant.



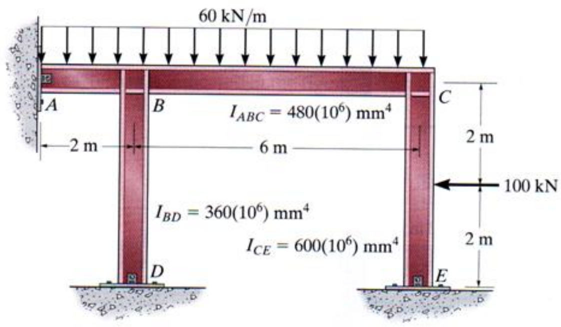
Q.5. (Hibbeler, 6th edition, P11-14)

Determine the reactions at *A* and *D*. Take *EI* to be the same for each member. Assume the supports at *A* and *D* are fixed.



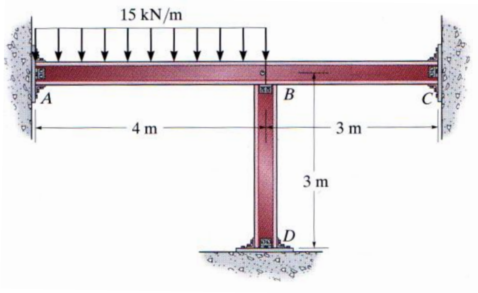
Q.6. (Hibbeler, 6th edition, P11-15)

Determine the internal moments acting at each joint. Assume *A*, *D*, and *E* are pinned and *B* and *C* are fixed joints. Take *E*= 200 GPa. The moment of inertia of each member is listed in the figure.



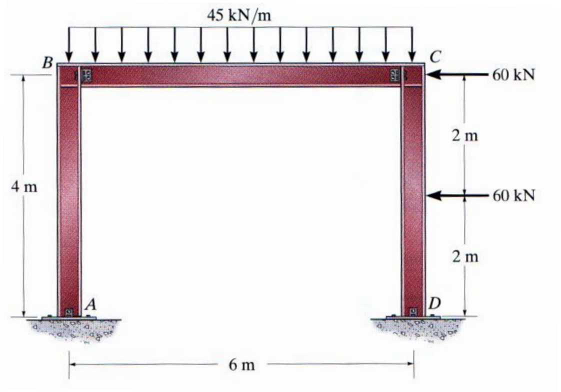
Q.7. (Hibbeler, 6th edition, P11-18)

When the 15 kN/m load is applied to the three-member frame the support at D settles 10 mm. Determine the moment acting at each of the fixed supports A, C, and D. The members are pin connected at B. E= 200 GPa, and I= 800(10^6) mm^4.



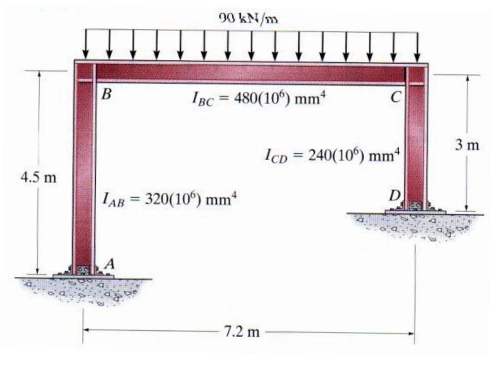
Q.8. (Hibbeler, 6th edition, P11-21)

Determine the moments at the ends of each member. Assume A and D are pins and B and C are fixed-connected joints. EI is the same for all members.



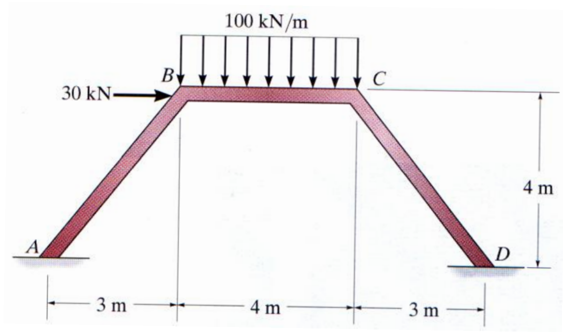
Q.9. (Hibbeler, 6th edition, P11-22)

Determine the moments acting at the ends of each member. Assume the supports at A and D are fixed. The moment of inertia of each member is indicated in the figure. E= 200 GPa.



Q.10. (Hibbeler, 6th edition, P11-26)

Determine the moments acting at the supports A and D of the battered-column frame. Take E= 200 GPa, I= 50(10^6) mm^4.



Answers of Problem Set 3

Q.1)

$M_{AB} = -43.5$ kN·m; $M_{BA} = 57$ kN·m;
$M_{BC} = -57$ kN·m; $M_{CB} = 84$ kN·m

Q.2)

M_{BA}= -181.787 kNm; M_{AB}= 181.787 kNm;
M_{CB}= 162.49 kNm; M_{CD}= -162.49 kNm;

Q.3)

$M_{BA} = -38.7$ kN·m; $M_{BC} = -38.7$ kN·m

Q.4)

M_A= -30.16 kNm; M_B= -16.02 kNm;
M_C= -30.16 kNm

Q.5)

$M_{AB} = 244$ kN·m; $M_{DC} = -244$ kN·m;

Segment AB: $A_x = 146.3$ kN;
Entire frame: $D_y = 480$ kN;

Q.6)

$M_{BA} = 126.9$ kN·m; $M_{BC} = -163.2$ kN·m
$M_{CB} = 148.9$ kN·m; $M_{BD} = 36.3$ kN·m;
$M_{CE} = -148.9$ kN·m

Q.7)

$M_{AB} = -330$ kN·m; $M_{CB} = 400$ kN·m;
$M_{DB} = 0$

Q.8)

$M_{BA} = 280$ kN·m; $M_{BC} = -280$ kN·m;
$M_{CB} = -79.6$ kN·m; $M_{CD} = 79.6$ kN·m

Q.9)

$M_{AB} = 172$ kN·m; $M_{BA} = 294$ kN·m;
$M_{BC} = -294$ kN·m; $M_{CB} = 236$ kN·m;
$M_{CD} = -236$ kN·m; $M_{DC} = -75.3$ kN·m

Q.10)

$M_{AB} = 25.4$ kN·m; $M_{DC} = -56.7$ kN·m