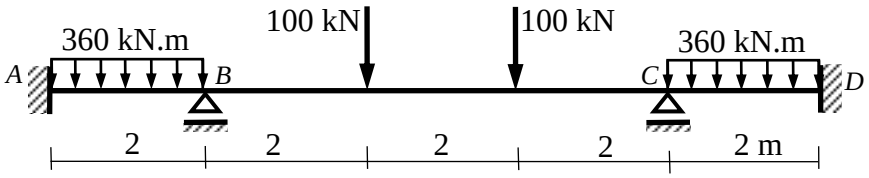
Ministry of Higher Education
Giza Higher Institute of Engineering & Technology
Civil Engineering Department
Course Name: **Theory of Structures (2)B**
Course Code : **CIV 221** Date: **28 / 6 / 2021**

Academic Year: **2020/2021**
Semester: **Second**
Level: **2st Civil**
Time: **3 Hours**
Examiner: ***Dr. M. Abdel-Kader***

Final Exam

Total Marks: **70** No. of Questions:**40** (Attempt all questions)

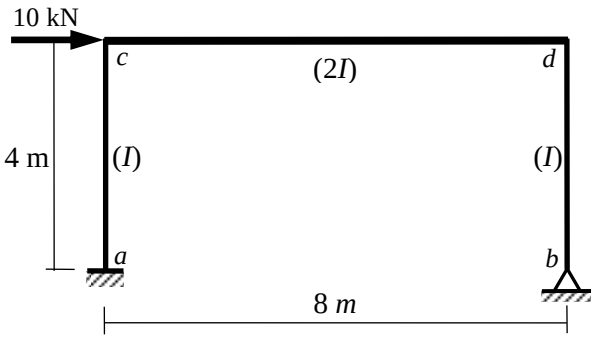
For the shown beam, use **the three-moment equation** to draw the bending moment diagram.



Choose the nearest answer.

1. Due to symmetry, the shown beam has only … independent unknown moments at supports.
   (A) 1 (B) 2 (C) 3 (D) 4
2. Due to symmetry, the moment at the support *C* is equal to the moment at the support …
   (A) *A* (B) *B* (C) *C* (D) *D*
3. In M_o-diagram due to the given loads, the maximum moment in the span *AB* is:
   (A) zero (B) 180 kN.m (C) 80 kN.m (D) 90 kN.m
4. In M_o-diagram due to the given loads, the maximum moment in the span *BC* is:
   (A) 400 kN.m (B) 200 kN.m (C) 400 N.m (D) 400 kN.mm
5. The elastic reaction at the support *A* (r_{AB}) is:
   (A) zero (B) 120 (C) 400 (D) 180
6. The elastic reactions at the support *B* (r_{BA} & r_{BC}) are:
   (A) zero & 120 (B) zero & 400 (C) 120 &400 (D) 120 & 120
7. The final moment at the support *A* is:
   (A) -10.0 kN.m (B) -114.3 kN.m (C) -180 kN.m (D) -220.7 kN.m
8. The final moment at the support *B* is:
   (A) -90 kN.m (B) -131.4 kN.m (C) -180 kN.m (D) -20.1 kN.m
9. The final moment at the support *C* is:
   (A) -90.0 kN.m (B) -180 kN.m (C) -131.4 kN.m (D) -20.1 kN.m
10. The final maximum positive moment in the span *BC* is:
    (A) 8.5 kN.m (B) 168.7 kN.m (C) 68.6 kN.m (D) 180 kN.m

For the shown frame, use the **consistent deformations** (**virtual work**) method and **take the main system by removing the hinged support at *b*.** Note that the relative moments of inertia are given between brackets as shown. *E* is constant.

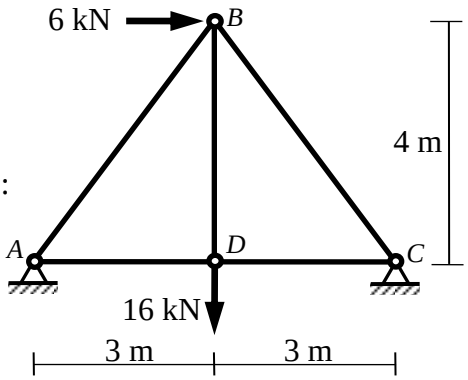


Choose the nearest answer.

11. The moment at *c* in M_o-diagram due to the given loads is:
    (A) 10 kN.m (B) zero (C) 40 kN.m (D) 30 kN.m
12. The moment at *a* in M_o-diagram due to the given loads is:
    (A) 10 kN.m (B) -40 kN.m (C) zero (D) -1 kN.m
13. The value of the moment at *c* in M_1-diagram due to the horizontal redundant $X_1 = X_b = 1$ kN at *b* is:
    (A) zero (B) 4 kN.m (C) 1 kN.m (D) 10 kN.m
14. The value of the moment at *c* in M_2-diagram due to the vertical redundant $X_2 = Y_b = 1$ kN at *b* is:
    (A) 40 kN.m (B) zero (C) 8 kN.m (D) 10 kN.m
15. The value of the deflection δ_{10} is:
    (A) $320/3EI$ (B) $40/3EI$ (C) $20/3EI$ (D) $100/3EI$
16. The value of the deflection δ_{12} is:
    (A) $90/EI$ (B) $2/EI$ (C) $128/EI$ (D) $8/EI$
17. The value of the deflection δ_{22} is:
    (A) $90/EI$ (B) $1024/3EI$ (C) $128/EI$ (D) $8/EI$
18. The value of the final horizontal reaction at the hinged support *b* ($X_1 = X_b$) is:
    (A) 100 kN (B) 23 kN (C) 10 kN (D) 2.3 kN
19. The value of the final moment at *a* is:
    (A) 100 kN.m (B) 180 kN.m (C) 2.8 kN.m (D) 18.2 kN.m
20. The value of the final moment at *c* is:
    (A) 38.9 kN.m (B) 12.7 kN.m (C) 10 kN.m (D) zero

Please turn over

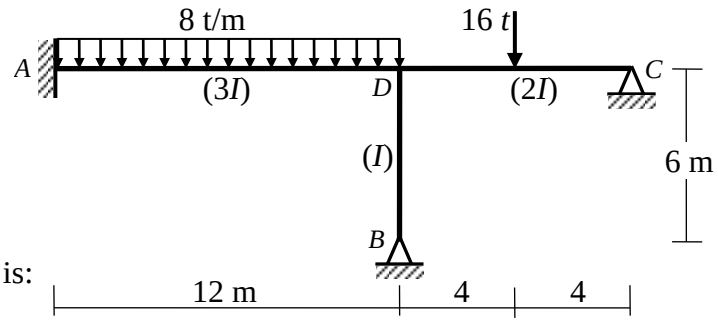
For the shown truss, use the **consistent deformations (virtual work)** method, and **take the main system by replacing the hinged support at *C* by roller support**. Assume *EA* = 1000 *kN* for all members.



Choose the nearest answer.

21. The horizontal reaction at the hinged support *A* due to the given loads is:
(A) zero (B) 6 kN ← (C) 6 N ← (D) 16 kN ←
22. The force in member *AB* due to the given loads is:
(A) zero (B) -8 kN (C) -5 kN (D) -15 kN
23. The value of the force in member *AD* due to load X_1=1 kN is:
(A) zero (B) 6 kN (C) 1 kN (D) 16 kN
24. The value of the deflection δ_{10} is:
(A) 2.2 (B) 0.6 (C) 0.054 (D) zero
25. The final horizontal reaction at the hinged support *C* (X_1) is:
(A) 9 kN ← (B) 3 kN ← (C) 6 kN ← (D) 6 kN ↑
26. The final vertical reaction at the hinged support *A* is:
(A) 4 kN ↑ (B) 3 kN ↑ (C) 6 kN ← (D) 6 kN ↑

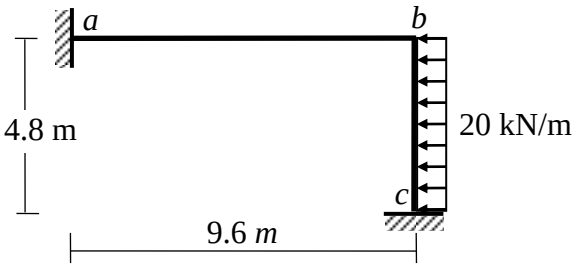
For the shown frame, use **the slope deflection method**, draw the bending moment diagram. The relative moments of inertia are given between brackets. Neglect axial deformation.



Choose the nearest answer.

27. The value of the fixed end moments of span *AD* is:
(A) 8 m.t (B) 6 m.t (C) 24 m.t (D) 96 m.t
28. The value of the fixed end moment of span *DC* at *D* is:
(A) 8 m.t (B) 6 m.t (C) 96 m.t (D) 24 m.t
29. The value of the fixed end moment of column *DB* at *D* is:
(A) zero (B) 4 m.t (C) 8 m.t (D) 16 m.t
30. The value of the unknown displacements is.
(A) 32/*EI* (B) 2/*EI* (C) 200/*EI* (D) 122/*EI*
31. The value of the final moment at *A* is:
(A) 8 m.t (B) 2 m.t (C) 112 m.t (D) 32 m.t
32. The final maximum negative moment in the span *DC* is:
(A) -4 m.t (B) -8 m.t (C) -48 m.t (D) -18 m.t
33. The value of the final maximum moment in the column *BD* is:
(A) zero (B) 6 m.t (C) 16 m.t (D) 60 m.t

For the shown frame, using **the moment distribution method**, draw the bending moment diagram. Assume that *EI* is constant.



Choose the nearest answer.

34. The value of the fixed end moments of span *ab* is:
(A) 38.4 kN.m (B) 20 kN.m (C) zero (D) 4.8 kN.m
35. The value of the fixed end moment of column *bc* at *b* is:
(A) 9.6 kN.m (B) zero (C) 20 kN.m (D) 38.4 kN.m
36. The value of the fixed end moment of column *bc* at *c* is:
(A) zero (B) 96 kN.m (C) 20 kN.m (D) 38.4 kN.m
37. The distribution factors of the excess bending moment at joint *b* are:
(A) 4/7 & 3/7 (B) 4/3 & 2/3 (C) 1/3 & 2/3 (D) 1/2 & 1/2
38. The final bending moment at *a* is:
(A) 6.4 kN.m (B) 20 kN.m (C) 12.8 kN.m (D) zero
39. The final bending moment at *b* is:
(A) zero (B) -12.8 kN.m (C) 6.4 kN.m (D) -96 kN.m
40. The final bending moment at *c* is:
(A) -51.2 kN.m (B) -11.2 kN.m (C) -96 kN.m (D) -20 kN.m

With my best wishes
Dr. M. Abdel-Kader