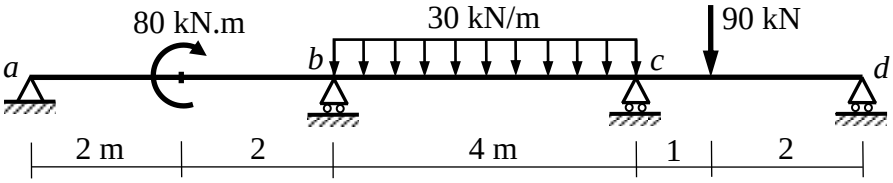
Ministry of Higher Education
Giza Higher Institute of Engineering & Technology
Civil Engineering Department
Course Name: **Theory of Structures (2)B**
Course Code : **CIV 221** Date: **7 / 6 / 2022**

Academic Year: **2021/2022**
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)

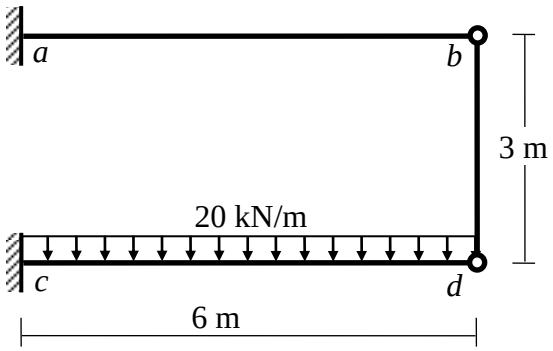
For the shown beam, use **the three-moment equation** to draw the shear force and the bending moment diagrams.



Choose the nearest answer.

1. The shown beam has … unknown moments at supports.
   (A) 1 (B) 2 (C) 3 (D) 4
2. In M_o-diagram due to the given loads, the maximum moment in the span *ab* is:
   (A) 20 kN.m (B) 80 kN.m (C) 40 kN.m (D) 90 kN.m
3. In M_o-diagram due to the given loads, the maximum moment in the span *bc* is:
   (A) 15 kN.m (B) 30 kN.m (C) 40 kN.m (D) 60 kN.m
4. The elastic reaction at the support *b* from span *ba* (r_{ba}) is:
   (A) zero (B) 13.33 (C) 20 (D) 40
5. The elastic reaction at the support *b* from span *bc* (r_{bc}) is:
   (A) 30 (B) 60 (C) 80 (D) 120
6. The elastic reactions at the support *c* (r_{cb} & r_{cd}) are:
   (A) 80 & 50 (B) 60 & 50 (C) 120 & 90 (D) 80 & 45
7. The final moment at the support *b* is:
   (A) -22.7 kN.m (B) -25.4 kN.m (C) -30.3 kN.m (D) -49.2 kN.m
8. The final moment at the support *c* is:
   (A) -25.4 kN.m (B) -49.2 kN.m (C) -55.2 kN.m (D) -42.1 kN.m
9. The final maximum positive moment in the span *ab* is:
   (A) 47.3 kN.m (B) 72.2 kN.m (C) 28.7 kN.m (D) 51.4 kN.m
10. The final shear force at *a* is:
    (A) zero (B) 12.2 kN (C) -25.7 kN (D) -36.4 kN
11. The final shear force at *d* is:
    (A) -76.2 kN (B) -12.2 kN (C) -25.7 kN (D) -13.6 kN

For the shown frame, use the **consistent deformations** (**virtual work**) method to draw the bending moment diagram. **Take the main system by replacing the fixed support at *C* by hinged support**. *EI* is constant.

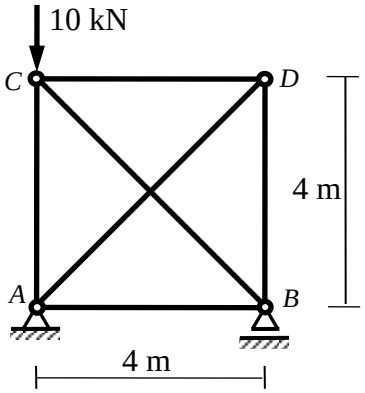


Choose the nearest answer.

12. The moment at *a* in M_o-diagram due to the given loads is:
    (A) -900 kN.m (B) zero (C) -360 kN.m (D) -450 kN.m
13. The moment at *c* in M_o-diagram due to the given loads is:
    (A) 20 kN.m (B) 120 kN.m (C) zero (D) 60 kN.m
14. The value of the moment at *a* in M_1-diagram due to the moment redundant X_1 =1 kN.m at *c* is:
    (A) zero (B) 1 kN.m (C) 3 kN.m (D) 6 kN.m
15. The value of the moment at *c* in M_1-diagram due to the moment redundant X_1 =1 kN.m at *c* is:
    (A) zero (B) 1 kN.m (C) 3 kN.m (D) 6 kN.m
16. The value of the deflection δ_{10} is:
    (A) 900/*EI* (B) 2250/*EI* (C) 200/*EI* (D) 400/3*EI*
17. The value of the deflection δ_{11} is:
    (A) 16/*EI* (B) 2/*EI* (C) 8/*EI* (D) 4/*EI*
18. The value of the final moment reaction at the fixed support *c* (X_1=M_c) is:
    (A) 225 kN.m (B) 562.5 kN.m (C) 107.5 kN.m (D) 82.3 kN.m
19. The value of the final moment at *a* is:
    (A) 270 kN.m (B) 180 kN.m (C) 337.5 kN.m (D) 135 kN.m
20. The value of the final moment at *b* is:
    (A) 1 kN.m (B) 4 kN.m (C) 135 kN.m (D) zero

Please turn over

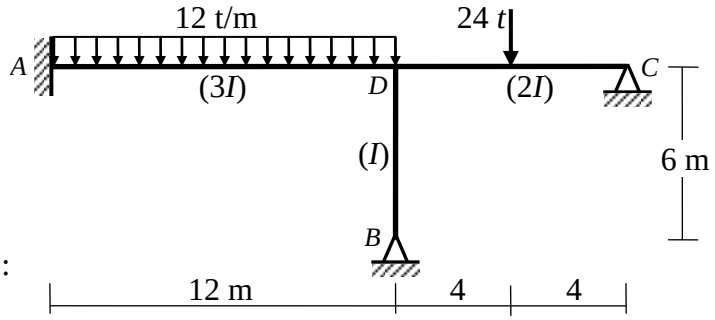
For the shown truss, use the **consistent deformations** (**virtual work**) method to determine the forces in the members. **Take the main system by removing the member *BC***. Assume *EA* is constant for all members.



Choose the nearest answer.

21. The vertical reaction at the hinged support *A* due to the given loads (N_o) is:
    (A) zero (B) 5 kN ↑ (C) 20 N ↑ (D) 10 kN ↑
22. The force in member *AC* due to the given loads (N_o) is:
    (A) 10 kN C (B) zero (C) 5 kN C (D) 10 kN T
23. The value of the force in member *AC* due to force X_1=1 kN in member *CB* is:
    (A) zero (B) 1 kN (C) 0.71 kN (D) 1.41 kN
24. The value of the deflection δ_{10} is:
    (A) 28.3/*EA* (B) 83.2/*EA* (C) 0.54/*EA* (D) 13.2/*EA*
25. The final force in member *AC* is:
    (A) 8.96 C (B) 7.28 kN C (C) 6.71 kN C (D) 7.91 kN T
26. The final force in member *AB* is:
    (A) 1 C (B) 1 T (C) zero (D) 0.71 kN C

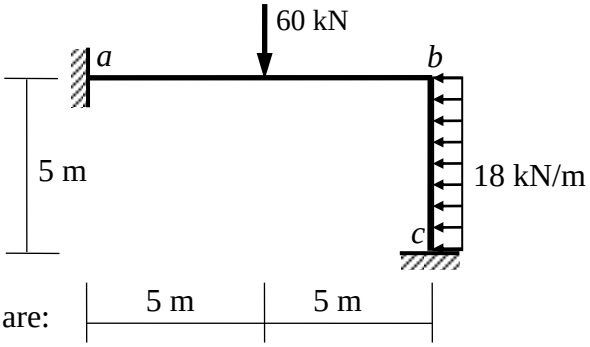
For the shown frame, use **the slope deflection method** to draw the bending moment diagram. Note that *E* is constant and the relative moments of inertia are given between brackets. Neglect axial deformation.



Choose the nearest answer.

27. The value of the fixed end moments of span *AD* is:
    (A) 12 m.t (B) 9 m.t (C) 36 m.t (D) 144 m.t
28. The value of the fixed end moment of span *DC* at *D* is:
    (A) 12 m.t (B) 9 m.t (C) 144 m.t (D) 36 m.t
29. The value of the fixed end moment of column *DB* at *D* is:
    (A) zero (B) 6 m.t (C) 12 m.t (D) 16 m.t
30. The value of the unknown displacement θ_D is.
    (A) 48/*EI* (B) 3/*EI* (C) 300/*EI* (D) 183/*EI*
31. The value of the final moment at *A* is:
    (A) 12 m.t (B) 3 m.t (C) 168 m.t (D) 48 m.t
32. The final maximum negative moment in the span *DC* is:
    (A) -6 m.t (B) -12 m.t (C) -72 m.t (D) -27 m.t
33. The value of the final maximum moment in the column *BD* is:
    (A) zero (B) 9 m.t (C) 24 m.t (D) 90 m.t

For the shown frame, use **the moment distribution method** to draw the bending moment diagram. *EI* is constant.



Choose the nearest answer.

34. The value of the fixed end moment of span *ab* at *b* is:
    (A) 150 kN.m (B) 60 kN.m (C) 75 kN.m (D) 500 kN.m
35. The value of the fixed end moment of column *bc* at *b* is:
    (A) 11.25 kN.m (B) 18 kN.m (C) 56.25 kN.m (D) 37.5 kN.m
36. The distribution factors of the excess bending moment at joint *b* are:
    (A) 4/7 & 3/7 (B) 1/3 & 2/3 (C) 10/3 & 5/3 (D) 1/2 & 1/2
37. The final bending moment at *a* is:
    (A) -81.25 kN.m (B) -62.25 kN.m (C) -25.25 kN.m (D) -75.25 kN.m
38. The final bending moment at *b* is:
    (A) -32.5 kN.m (B) -12.8 kN.m (C) -37.5 kN.m (D) -62.5 kN.m
39. The final bending moment at *c* is:
    (A) -51.2 kN.m (B) -25 kN.m (C) -96 kN.m (D) 20 kN.m
40. The final bending moment at the middle of column *bc* is:
    (A) 25 kN.m (B) 12.5 kN.m (C) 37.5 kN.m (D) -62.5 kN.m

With my best wishes
Dr. M. Abdel-Kader