Ministry of Higher Education
Giza Higher Institute of Engineering & Technology
Civil Engineering Department
Course Name: **Theory of Structures (2)A**
Course Code: **CIV 211** Date: **6 / 3 / 2021**

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

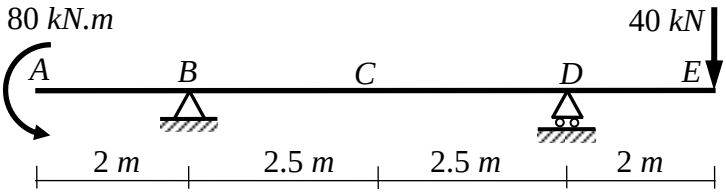
Final Exam

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

Choose the nearest answer.

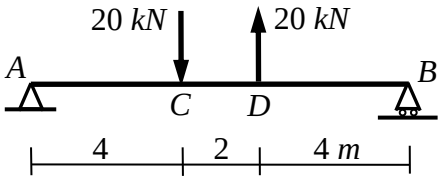
For the shown beam, it is required to determine the deflections at ***A***, ***C*** and ***E*** and the slope at ***A*** by using the **double integration method**.

$EI = 5\times10^4\ kN.m^2$

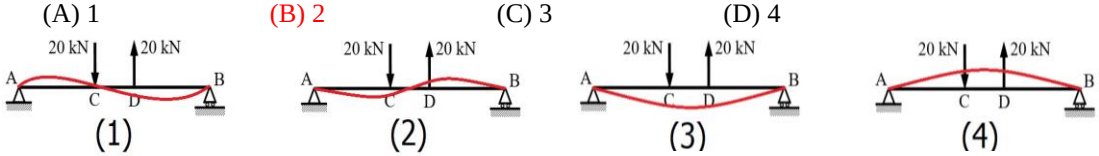


1. The vertical reaction at the hinged support ***B*** is:
   (A) 40 *kN* ↑ (B) 40 *kN* ↓ (C) 80 *kN* ↑ (D) zero
2. The vertical reaction at the hinged support ***D*** is:
   (A) 40 *kN* ↑ (B) 40 *kN* ↓ (C) 80 *kN* ↑ (D) 10 *kN* ↓
3. The bending moment equation (M) in the last part ***DE*** is:
   (A) -80 (x) + 40 (x–7) (B) -80 $(x)^0$ + 40 (x–7) (C) -80 $(x)^2$ + 40 (x) (D) -80 $(x)^0$ - 40 $(x)^2$
4. EIy' = ……
   (A) -80 (x) + 40 (x–7) (B) -80 x + 20 $(x–7)^2 + C_1$ (C) -80 $(x)^2$ + 40 (x) (D) -80 $(x)^0$ - 40 $(x)^2$
5. EIy = ……
   (A) -40 $(x)^2$ + 20 $(x–7)^2 + C_1x$ (B) -80 x + 20 $(x–7)^2 + C_1x + C_2$ (C) -40 x^2 + 20 $(x–7)^3/3 + C_1x + C_2$ (D) -40+ $C_1x + C_2$
6. Boundary Conditions are:
   (A) At x= 0, y= 0 & at x= 9, y= 0 (B) At x= 2, y= 0 & at x= 9, y'= 0 (C) At x= 2, y= 0 & at x= 7, y= 0
7. C_1 and C_2 are:
   (A) C_1=360 and C_2=-560 (B) C_1=360 and C_2=0 (C) C_1=30 and C_2=-50 (D) C_1=0 and C_2=-560
8. The deflection at ***A***, y_A is:
   (A) 11.2 *mm* ↑ (B) 5 *mm* ↑ (C) zero (D) 11.2 *mm* ↓
9. The deflection at ***C***, y_C is:
   (A) 11.2 *mm* ↑ (B) 10.1 *mm* ↑ (C) zero (D) 5 *mm* ↑
10. The deflection at ***E***, y_E is:
    (A) 11.2 *mm* ↑ (B) 10.1 *mm* ↑ (C) zero (D) 10.1 *mm* ↓
11. The slope at ***A***, $\theta_A = y'_A$ is:
    (A) 0.0072 rad (B) 0.72 rad (C) 0.12 rad (D) 0.41 rad

For the shown beam, it is required to determine the slopes at ***A*** & ***C*** and the deflection at ***D*** by using the **moment-area method**. $EI = 2.5\times10^3\ kN.m^2$

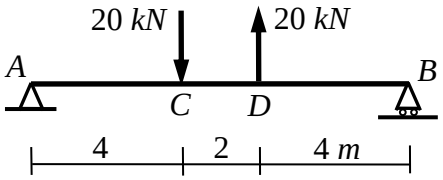


12. The vertical reaction at the hinged support ***A*** is:
    (A) 20 *kN* ↑ (B) 20 *kN* ↓ (C) 4 *kN* ↑ (D) 4 *kN* ↓
13. The bending moment at ***C*** is:
    (A) 32 *kN.m* (B) 16 *kN.m* (C) 40 *kN.m* (D) -16 *kN.m*
14. The bending moment at ***D*** is:
    (A) 32 *kN.m* (B) 16 *kN.m* (C) 40 *kN.m* (D) -16 *kN.m*
15. The deviation of ***B*** relative to the tangent of the elastic curve at ***A***, $t_{B/A}$ is:
    (A) 0.032 *m* (B) 0.016 *m* (C) 0.064 *m* (D) 0.046 *m*
16. The slope of the tangent of the elastic curve at ***A***, θ_A is:
    (A) 0.0032 rad ↻ (B) 0.0064 rad ↻ (C) 0.0016 rad ↻ (D) 0.0016 rad ↺
17. The slope of the tangent of the elastic curve at ***C***, θ_C is:
    (A) 0.0064 rad ↺ (B) 0.0064 rad ↻ (C) 0.0016 rad ↻ (D) 0.0016 rad ↺
18. The deviation of ***D*** relative to the tangent of the elastic curve at ***A***, $t_{D/A}$ is:
    (A) 0.032 *m* (B) 0.024 *m* (C) 0.047 *m* (D) zero
19. The deflection at ***D***, δ_D is:
    (A) 4.27 *mm* ↑ (B) 8.53 *mm* ↑ (C) zero (D) 4.27 *mm* ↓
20. The nearest elastic curve of the shown beam is:
    (A) 1 (B) 2 (C) 3 (D) 4



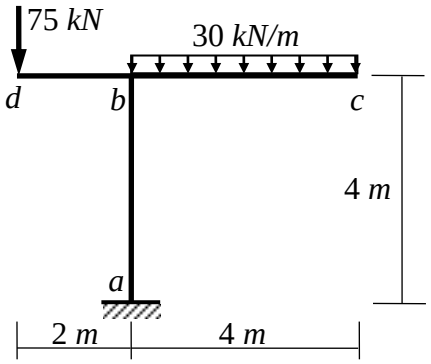
Please turn over

For the shown beam, it is required to determine the slopes at ***B*** & ***D***, the deflection at ***C*** and the maximum deflection for the beam by using the **conjugate beam method**. $EI = 2.5\times10^3\ kN.m^2$.



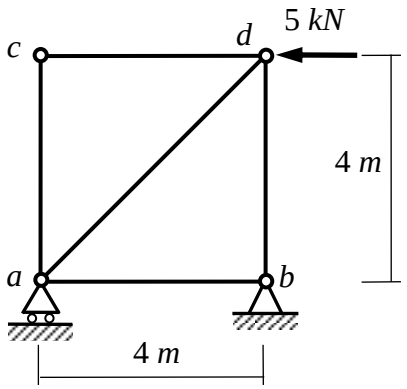
21. After loading M on the conjugate beam, the elastic reaction at support ***A*** is:
    (A) 32 $kN.m^2\uparrow$ (B) 64 $kN.m^2\downarrow$ (C) 32 $kN.m^2\downarrow$ (D) 16 $kN.m^2\uparrow$
22. After loading M on the conjugate beam, the elastic reaction at support ***B*** is:
    (A) 32 $kN.m^2\uparrow$ (B) 16 $kN.m^2\downarrow$ (C) 32 $kN.m^2\downarrow$ (D) 15 $kN.m^2\downarrow$
23. The slope of the tangent of the elastic curve at ***B***, θ_B is:
    (A) 0.0064 rad ↺ (B) 0.0064 rad ↻ (C) 0.0016 rad ↻ (D) 0.0016 rad ↺
24. The slope of the tangent of the elastic curve at ***D***, θ_D is:
    (A) 0.0064 rad ↺ (B) 0.0064 rad ↻ (C) 0.0016 rad ↻ (D) 0.0016 rad ↺
25. The deflection at ***C***, δ_C is:
    (A) 4.27 $mm\uparrow$ (B) 8.53 $mm\uparrow$ (C) zero (D) 8.53 $mm\downarrow$
26. The maximum downward deflection is at a distance from support ***A*** =:
    (A) 3.828 m (B) 5.00 m (C) 2.828 m (D) 0.046 m
27. The maximum downward deflection is:
    (A) 12.1 mm (B) 5.00 mm (C) 8.53 mm (D) 46.1 mm

For the shown frame, it is required to determine the vertical displacement at ***d*** (δ_{dv}) using the **virtual work method**. $EI=20\times10^3\ kN.m^2$.



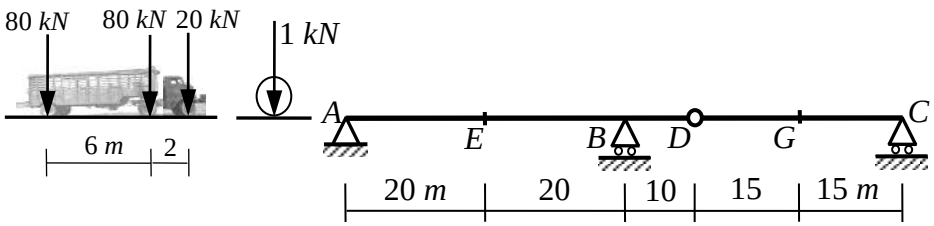
28. The bending moment due to the given load just at the left of ***b*** is:
    (A) -75 $kN.m$ (B) -240 $kN.m$ (C) -60 $kN.m$ (D) -150 $kN.m$
29. The bending moment due to the given load (M_o) just at the right of ***b*** is:
    (A) zero (B) -240 $kN.m$ (C) -60 $kN.m$ (D) -150 $kN.m$
30. The bending moment due to unit load (M_1) at ***d*** just at the right of ***b*** is:
    (A) zero (B) -240 $kN.m$ (C) -60 $kN.m$ (D) -150 $kN.m$
31. The vertical displacement at ***d***, δ_{dv} is:
    (A) 5.2 $mm\uparrow$ (B) 26 $mm\uparrow$ (C) zero (D) 20 $mm\downarrow$

For the shown truss, it is required to determine the vertical displacement at ***d*** (δ_{dv}) using the **virtual work method**. EA=1000 kN



32. The force in member ***cd*** due to the given load (N_o) is:
    (A) zero (B) -5 kN (C) 5 kN (D) -7.1 kN
33. The force in member ***bd*** due to the given load (N_o) is:
    (A) zero (B) -5 kN (C) 5 kN (D) -7.1 kN
34. The force in member ***cd*** due to the vertical unit load (N_1) is:
    (A) zero (B) -5 kN (C) 5 kN (D) -7.1 kN
35. The vertical displacement at ***d***, δ_{dv} is:
    (A) 12 $mm\uparrow$ (B) 20 $mm\uparrow$ (C) zero (D) 20 $mm\downarrow$

For the shown beam, it is required to draw the influence line for the reaction C_y (*I.L.*for C_y) and the bending moment at the section ***G*** (*I.L.*for M_G). Also, determine the maximum moment at ***G*** caused by the shown moving truck.



36. The value of *I.L.*for C_y when the unit load at ***C*** and is:
    (A) zero (B) 0.5 (C) 1 (D) 1.5
37. The value of *I.L.*for C_y when the unit load at ***D*** and is:
    (A) zero (B) 0.5 (C) 1 (D) 1.5
38. The value of *I.L.*for M_G when the unit load at ***C*** and is:
    (A) zero (B) 0.5 (C) 1 (D) 1.5
39. The value of *I.L.*for M_G when the unit load at ***G*** and is:
    (A) zero (B) 0.5 (C) 1 (D) 7.5
40. The maximum moment at ***G*** caused by the shown moving truck is:
    (A) zero (B) 1090 $kN.m$ (C) 190 $kN.m$ (D) -190 $kN.m$

With my best wishes
Dr. M. Abdel-Kader