KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2024

Level : B.E.
Year : III
Time : 2 hrs. 30mins.

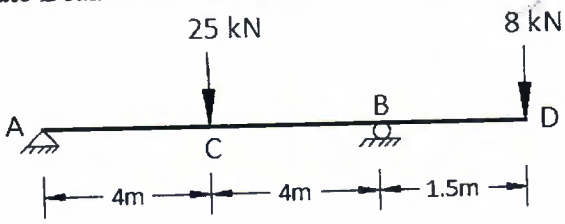
13 AUG 2024

Course : CIEG 305
Semester : I
F. M. : 40

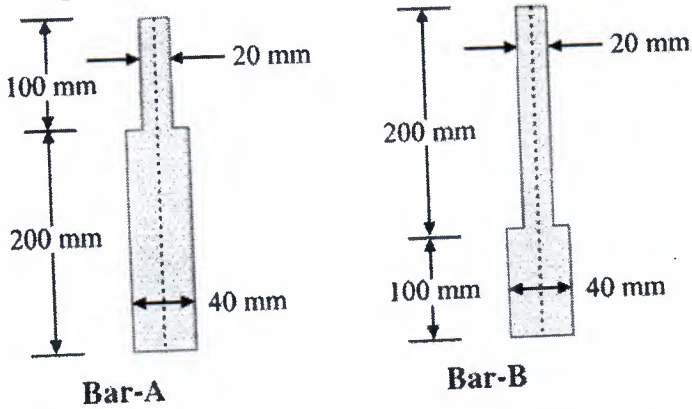
SECTION "B"

Attempt ALL questions. Assume suitable data if necessary.

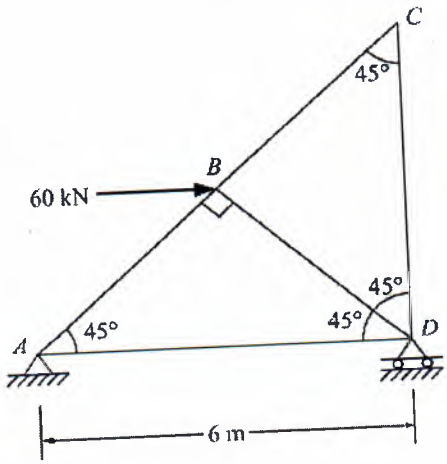
1. Determine slopes at A and D and deflection at C and D for the beam shown in figure below using Conjugate Beam method. Take E= 200 kN/mm^2 & I= 2.25 × 10^7 mm^4. [6]



2. Two similar round bars A and B are each 300 mm long as shown in figure below. The bar A receives an axial load, which produces a maximum stress of 100 MPa in the bar. Find the maximum stress produced on the bar B if the strain energy of both bars are same. [5]



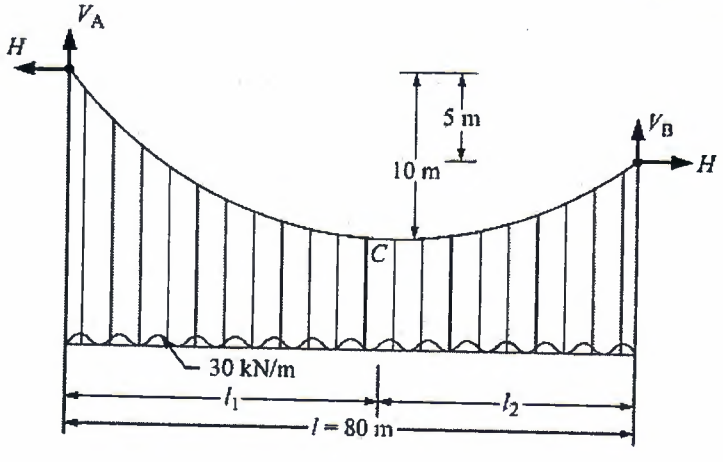
3. Each bar of the truss shown in figure below has a cross-sectional area of 600 mm^2 and E= 200 kN/mm^2. Calculate the vertical deflection of joint B if temperature of member BC alone is increased by 20°C and member AB being 15mm too short. Take coefficient of thermal expansion as 12 × 10^{-6} /°C. [8]



P.T.O.

4. A three-hinged parabolic arch of span 30m has its supports *A* & *B* at depths of 4m and 16m respectively below crown *C*. The arch carries a load of 80 kN at a distance of 5m to the left of *C* and a second load of 100 kN at 10m to the right of *C*. Determine the reactions at supports and bending moment under the loads. [6]

5. A cable is suspended from the points *A* and *B* which are 80m apart horizontally and are at different levels, the point *A* being 5m vertically higher than the point *B* and the lowest point in the cable is 10m below *A*. The cable is subjected to a uniformly distributed load of 30 kN/m over the horizontal span. Determine the horizontal and vertical reactions at each end and also the maximum tension in the cable. If the allowable stress for cable material is 120 N/mm^2, determine the length and diameter of cable required. [7]



6. A train of 5 wheel loads 240 kN, 260 kN, 400 kN, 160 kN and 120 kN spaced 2.5m moves on a simply supported girder of span 22.5m from right to left with 120 kN load leading. Using influence line diagram, determine the bending moment at 8m from right end and absolute maximum bending moment anywhere in the beam. [8]

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Marks Scored:

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Exam Roll No. :
Time: 30 mins.
F. M. : 10

Registration No.:
Date : 13 AUG 2024

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose and encircle in the most appropriate option from each set of choices

1. In moment area method, the deflection of point *A* from a tangent at *B* is equal to:
   a. Area of *M/EI* diagram between *A* & *B*
   b. Moment of *M/EI* diagram between *A* and *B* about *A*
   c. Moment of *M/EI* diagram between *A* and *B* about *B*
   d. Half area of *M/EI* diagram between *A* and *B*

2. Bending moment at any section in a conjugate beam gives _____ in the actual beam.
   a. Deflection b. Slope c. Curvature d. None of these

3. The ratio of the maximum deflection of a cantilever beam with an isolated load at its free end and with a uniformly distributed load over its entire length is:
   a. 1 b. 24/15 c.3/8 d. 8/3

4. If U_1 and U_2 are the strain energies stored in a prismatic bar due to axial tensile forces P_1 and P_2 respectively, then strain energy U stored in the same bar due to combined action of P_1 and P_2 will be:
   a. $U=U_1+U_2$ b. $U=U_1U_2$ c. $U>U_1+U_2$ d. $U<U_1+U_2$

5. A rectangular block of size 200mm x 100mm x 50mm is subjected to a shear stress of 100 N/mm^2. If the modulus of rigidity of material is 10^5 N/mm^2, strain energy stored will be:
   a. 10 Nm b. 25 Nm c. 50 Nm d. 100 Nm

6. By using unit load method, the slope at any point in the beam is determined by:
   a. Applying unit moment at that point
   b. Applying unit vertical load at that point
   c. Applying unit horizontal load at that point
   d. Applying unit deflection at that point

7. A three hinged parabolic arch *ACB* with crown at *C* is of span 20m and rise 5m. It is loaded with a u.d.l. of 5 kN/m over the portion *AC* and a point load of 50 kN acts at distance 5m from end *B*. Then, the horizontal thrust for the arch is:
   a. 150 kN b. 80 kN c. 65 kN d. 50 kN

8. An arch resist the external load by:
   a. Normal thrust and radial shear
   b. Radial shear and B.M.
   c. Normal thrust and B.M.
   d. Normal thrust, radial shear and B.M.

9. A parabolic arch has springings *A* and *B* at different levels. The height of crown point *C* from *A* is 5m and from *B* is 12m. If span of arch is 40m, horizontal distance of *AC* is:
   a. 24.3m b. 15.7m c. 21.7m d. 33.6m

10. Which of the following statement is *CORRECT*?
    a. Maximum tension occurs in cable supported at lower level.
    b. Due to rise in temperature, horizontal thrust in cable increases.
    c. Bending moment at any point in the cable is zero.
    d. For cables supported at different levels, horizontal thrust at two ends are different.

11. A suspension cable has a span of 100m with central dip of 10m. The length of cable is:
    a. 102.67m b. 100.27m c. 103.52m d. 101.23m

12. Which of the following statement is *INCORRECT*?
    a. Tension in an anchor cable and suspension cable will be same for pulley support.
    b. Tension in an anchor cable and suspension cable will not be same for roller support.
    c. Horizontal components of tension in anchor cable and suspension cable are equal for roller support.
    d. Maximum bending moment on tower occurs when cable is supported on roller support.

13. A single rolling load of 8 kN rolls along a girder of 15m span. The bending moment at section 8m from left support is:
    a. 2.52 kNm b. 5.82 kNm c. 3.73 kNm d. 4.89 kNm

14. An overhanging beam *ABC* has free end at *C* and overhanging portion *BC*. Length of *AB* is *'L'* and that of *BC* is *'a'*. The maximum ordinate of ILD for reaction at *B* will be:
    a. 1 b. (L+a)/L c. a/L d. (L-a)/L

15. The shape of ILD for shear force at any section in a cantilever beam is:
    a. Rectangle b. Triangle c. Trapezoid d. Parabolic

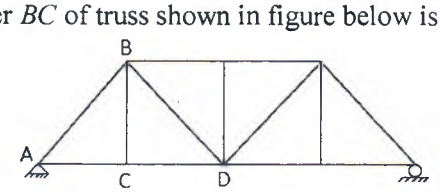
16. A u.d.l. of intensity 10 kN/m and length 8m traverses a girder of span 20m from left to right. The maximum B.M. at section 5m from left end will occur when tail of u.d.l. is at distance _____ from left end.
    a. 6m b. 5m c. 3m d. 2m

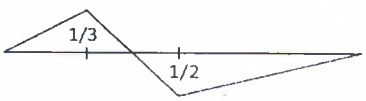
17. A train of 5 wheel loads 240 kN, 260 kN, 400 kN, 160 kN and 120 kN spaced 2.5m moves on a simply supported girder of span 22.5m from left to right with 240 kN load leading. The maximum ordinate of ILD for B.M. will occur at a distance _____ from left end.
    a. 11.61 m b. 9.11 m c. 13.39 m d. 10.89 m

18. Maximum ordinate of ILD for horizontal thrust in 3-hinged arch of span *L* and rise *h* is:
    a. 4h/L b. L/(4h) c. 4L/h d. 1

19. A wheel load from vehicle is transmitted from deck slab to _____ in truss bridge.
    a. Cross girder b. Nodes c. Stringers d. Bottom chord

20. The ILD for force in member *BC* of truss shown in figure below is:



a. 

b. 

c. 

d.