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Question Paper Code: R4103

B.E. / B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Fourth Semester

Civil Engineering

R21UCE403– STRUCTURAL ANALYSIS - I

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

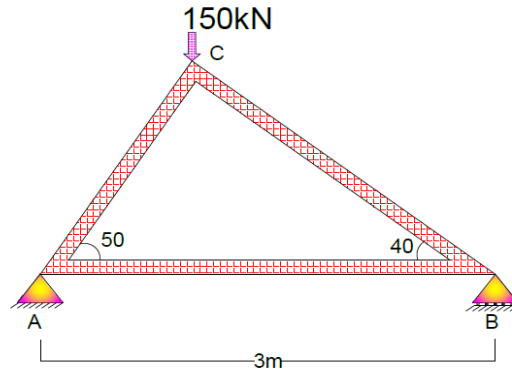
Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Differentiate: Determinate and indeterminate structures. CO1-U
2. Write the short notes on principle of virtual work method. CO1-U
3. How many slope deflection equations are available for a two span continuous beam and write the equations? CO1-U
4. Say true or false. Justify your answer “slope deflection method is a force method”. CO1-U
5. Differentiate between distribution factors and carry over factor. CO1-U
6. Write the short notes on stiffness. CO1-U
7. Write the short notes on Influence Line Diagram and its uses. CO1-U
8. What are the uses of influence line diagrams? CO1-U
9. Write the expression for rise at any point of parabolic arch. CO1-U
10. Draw the influence line for radial shear at a section of a three hinged arch. CO1-U

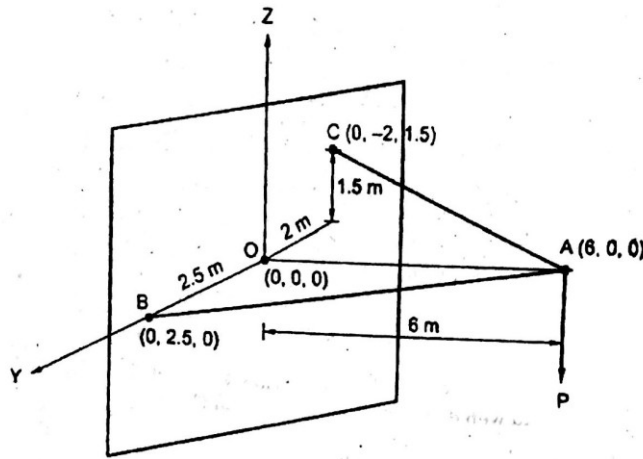
PART – B (5 x 16= 80Marks)

11. (a) Determine the vertical and horizontal displacement at joint ‘c’ for the pin jointed truss as shown in figure. If $A = 150 \times 10^{-6} \text{ m}^2$, $E = 2 \times 10^6 \text{ kN /m}^2$. Using method of virtual work concept. CO2-App (16)

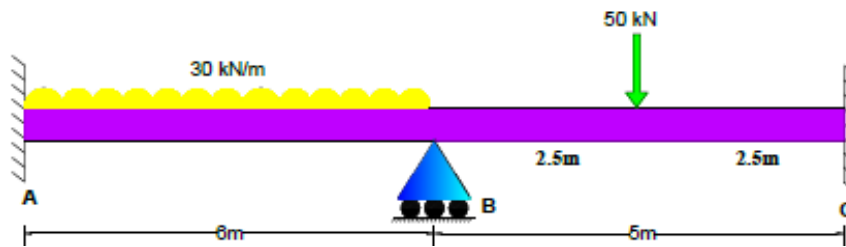


Or

- (b) A force P is applied at end A of the strut OA which is supported by two wires AB and AC , as shown in fig. O, B, C are in the same plane and OA is normal to this plane. Find the forces in OA, AB and AC . CO2-App (16)

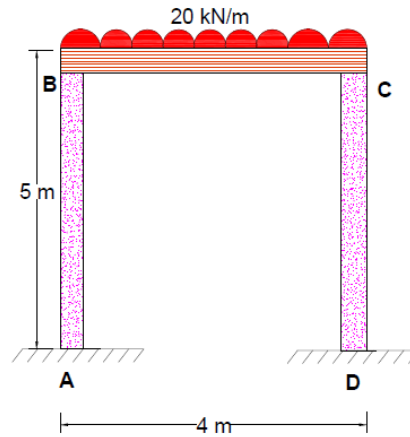


12. (a) Determine the slope of the given continuous beam loaded as shown in fig. by slope deflection method. Assume EI is uniform throughout. Sketch the bending moment diagram. CO3-App (16)

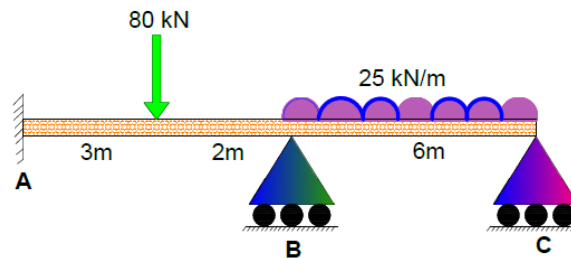


Or

- (b) Determine the bending moments of the portal frame $ABCD$ loaded as shown in figure by slope deflection method. Sketch the bending moment diagram. CO3-App (16)

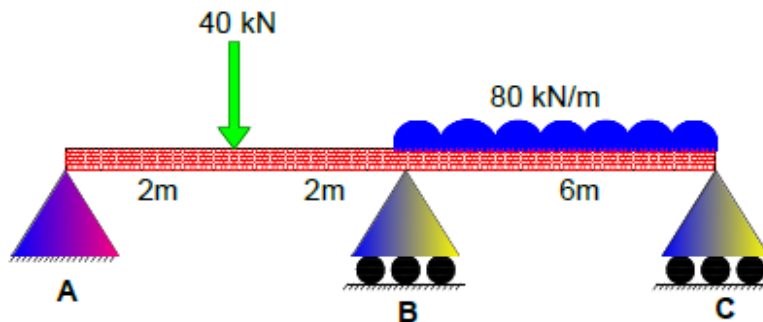


13. (a) Determine the moments at the support of the continuous beam loaded as shown in figure and draw the bending moment diagram by using moment distribution method. Assume the beam is of uniform section. CO3-App (16)



Or

- (b) Determine the bending moments of the following continuous beam as shown in figure by moment distribution method and draw the free BMD. CO3-App (16)



14. (a) Two point loads of 100 kN and 50 kN at a fixed distance apart of 2 m, cross a beam of 24 m span from left to right with the 50 kN leading. Draw the influence line for bending moment and shear force for a point of 8 m from the left support, and also evaluate the maximum bending moment and shear force at that point. CO4-Ana (16)

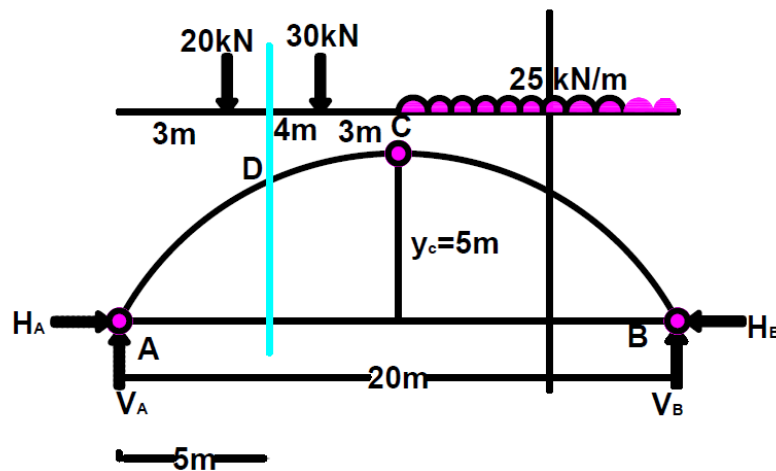
Or

- (b) Two point loads of 120kN and 200kN spaced 3m apart cross a girder of span 12 m from left to right with the 100kN leading. CO4-Ana (16)

1. Draw the ILD for shear force and bending moment and find the values of maximum bending moment
2. Analyze the maximum shear force and bending moment at a section 4 m from the left hand support.

Evaluate the absolute maximum bending moment due to the given loading system.

15. (a) A parabolic 3 hinged arch carries loads as shown in figure. CO5-Ana (16)
Analyze the resultant reactions at supports. Evaluate the bending moment, normal thrust and radial shear at 5 m from A. Estimate the maximum bending moment of the given structures



Or

- (b) A three hinged parabolic arch of span 40 m has abutments at unequal levels. The highest point of the arch is 4 m above left support and 9 m above the right abutment. The arch is subjected to an udl of 15kN/m over its entire horizontal span. Analyze the horizontal thrust and bending moment at a point 8 m from left support CO5-Ana (16)