C **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U4103

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Fourth Semester

Civil Engineering

21UCE403- STRUCTURAL ANALYSIS – I
(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

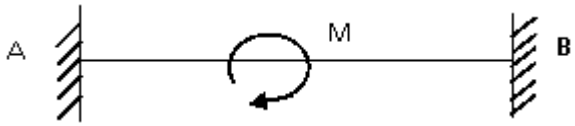
Answer All Questions

PART A - (5 x 1 = 5Marks)

1. How many equilibrium equations do we need to solve generally on each joint of a truss? CO2- App
   (a) 1 (b) 2 (c) 3 (d) 0
2. The frame structures may sway due to CO1- U
   (a) Horizontal force & unsymmetrical (b) Horizontal force only
   (c) Unsymmetrical of columns (d) All the above
3. If the far end is continuous then stiffness (K) is CO1 -U
   (a) 3EI/L (b) EI/L (c) 4EI/L (d) 6EI/L
4. A single point load crosses a simply supported girder. The absolute maximum bending moment will occur at centre when CO1- U
   (a) The load is at left support (b) The load is at centre
   (c) The entire span is loaded (d) The load is at right support
5. A single point load crosses a three hinge parabolic arch of span L, the maximum sagging moment will occur at CO1- U
   (a) 0.211L (b) 0.25L (c) 0.35L (d) 0.3L

PART – B (5 x 3= 15Marks)

6. Define the terms: Perfect Truss & Deficient Truss. CO1-U
7. Say true or false. Justify your answer “slope deflection method is a force method”. CO2-App
8. Determine the fixed end moments for a beam carrying a central clockwise moment. CO3-App

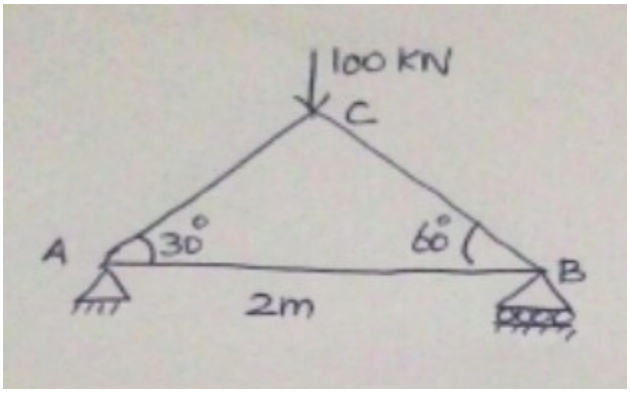


9. Two point loads 100 kN and 50 kN, 2m apart crosses a simply supported girder of span 10 m with 100 kN load as the leading load. Determine maximum bending moment at a section 4m from left support using ILD. CO2-App

10. How will you calculate the horizontal thrust in a two hinged parabolic arch if there is a rise in temperature? CO1-U

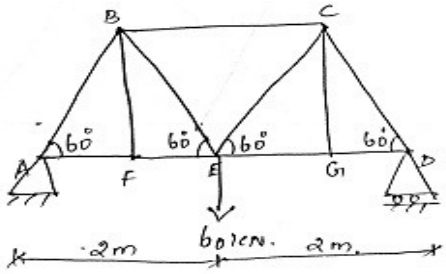
PART – C (5 x 16= 80Marks)

11. (a) Using the principle of virtual work, analyse the vertical deflection of joint C of the truss in Figure. Take E= 200 x 10^6 kN/m^2 and Cross sectional area of each bar = 100x 10^{-6} m^2 . CO2- App (16)

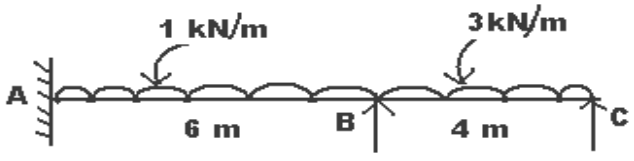


Or

(b) Using principle of virtual work, Determine the vertical displacement at Joint E of the Truss as shown in fig. CO2 -App (16)
Cross-sectional Area of each member = 400 mm^2& E=2*10^5 N/mm^2

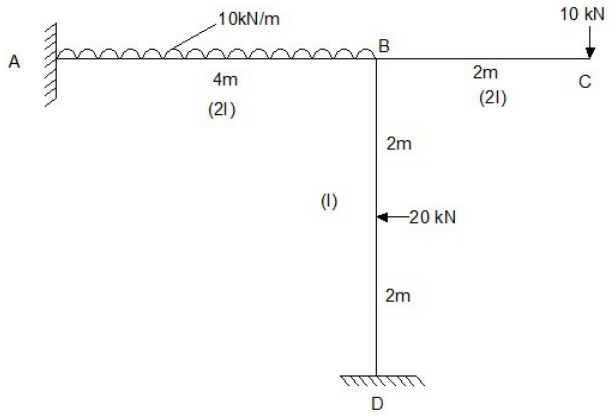


12. (a) Determine the bending moments for the continuous beam as shown in fig by solving the slope deflection method and also draw the shear force and bending moment diagram EI is constant. CO3 -App (16)



Or

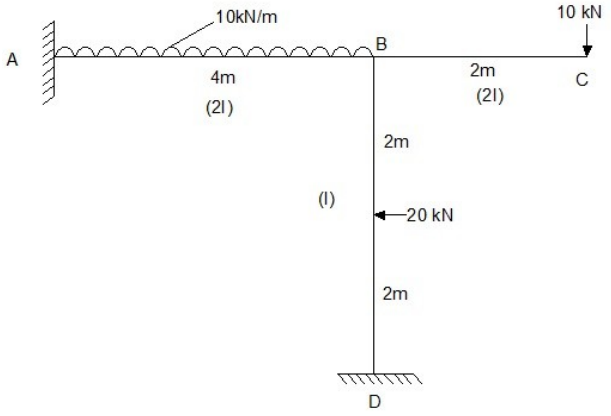
(b) Determine the bending moments for structure as shown in figure by slope deflection method. Sketch the super imposed bending moment diagram. CO3- App (16)



13. (a) A continuous beam ABC consists of spans AB and BC of 5 & 8 m length in each. Both ends of the beam are fixed. The span AB carries a udl of 15 kN/m. The span BC carries a point load of 25 kN at its middle point. Analyse the moments at the support and draw the bending moment diagram by using moment distribution method. Assume the beam is of uniform section. CO3- App (16)

Or

(b) Find the moments for the structure as shown in figure by moment distribution method. Sketch the bending moment diagram. CO3 -App (16)

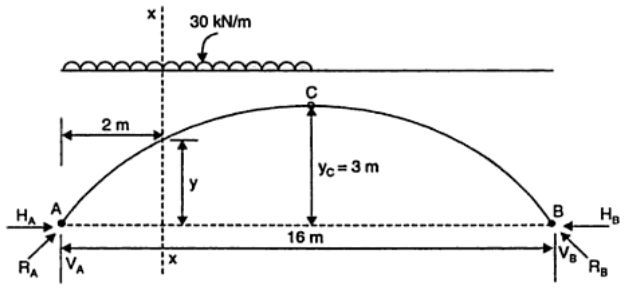


14. (a) Two point loads of 100 kN and 50 kN at a fixed distance apart of 2m, cross a beam of 24 m span from left to right with the 50kN leading, Draw the influence line for bending moment and shear force for a point of 8m from the left support, and also evaluate the maximum bending moment and shear force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

Or

(b) A continuous beam ABC of 6m span each portion hinged at B and rollers at A & C. Draw ILD for reaction at B with interval 1m — CO4 -Ana — (16)

15. (a) A parabolic 3 hinged arch carries a UDL of 30kN/m on the left half of the span. It has a span of 16m and a central rise of 3 m. Determine the resultant reactions at supports. Evaluate the bending moment, normal thrust and radial shear at a section 2 m from left support. — CO5 -Ana — (16)



Or

(b) Evaluate the horizontal thrust in a two hinged parabolic arch of span 10m and rise 25m carrying an UDL of 24kN/m over the left half span, assuming secant variation of its sectional moment of area. Also calculate the Bending Moment at the crown and draw the BMD. — CO5- Ana — (16)