U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E   **Semester: IV**
Branch: Civil Engineering   **Duration: 3 hrs.**
Course Code: 19CV4PCSTA   **Max Marks: 100**
Course: Structural Analysis   **Date: 12.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Distinguish between static and kinematic indeterminate structures, with example. **06**

   b) A Three hinged parabolic arch of span 25m and central rise 5m is subjected to UDL of intensity 20kN/m from crown hinge to the right support. Determine the normal thrust, radial shear and bending moment at quarter span from right support. Sketch the BMD. **14**

UNIT - II

2 a) A simply supported beam of span 6 m carries point loads of 10 KN and 20 KN acting at 2 m and 5 m respectively from left support. It also carried an UDL 12 kN/m that acts between point loads. Find the deflection under the 20 KN load using Macaulay's method. Assume EI is constant throughout the span **10**

   b) Calculate the slope and deflection at B and C of the cantilever beam, shown in Fig.2(b) using moment area method. Assume EI= $6 \times 10^3 KNm^2$ **10**
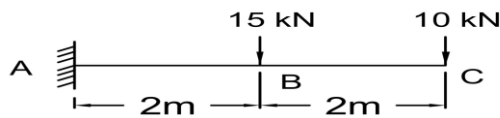

Fig. 2(b)

OR

3 a) Explain conjugate beam with examples. **05**

   b) For the cantilever beam shown in Fig. 3(b) assuming E=180GPa and I=45×10^6 mm^4, evaluate: **15**
   (i)   the slope and deflection at 'B' using moment area method
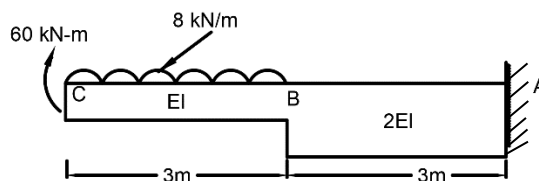   (ii)   the deflection at 'C' using conjugate beam method

Fig. 3(b)

UNIT - III

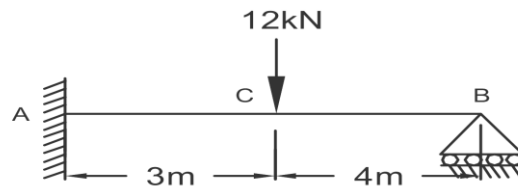4 a) Analyse the propped cantilever beam subjected to the loading as shown in fig.4(a). Draw SFD and BMD. **08**

Fig. 4(a)

b) A continuous beam ABC of two spans 10m and 12m is fixed at A and simply supported at B and C. The beam carries an udl of 18kN/m over the entire span of the beam. Analyze the beam using theorem of three moments and sketch the BMD and SFD. **12**

UNIT - IV

5 a) Derive the expression for strain energy stored in a member due to bending. **06**

b) Determine the horizontal and vertical deflection of joint D of the truss shown in Fig 5(b) using Castigliano's theorem. Assume $E = 2.1 \times 10^5$ N/mm^2 and area of AC, CG, GD, DF as 1000mm^2 and all other members as 1200mm^2. **14**
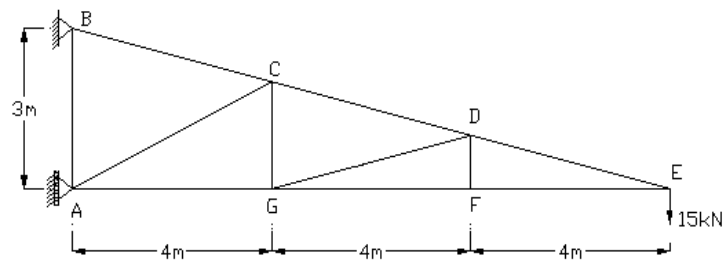

Fig. 5(b)

OR

6 a) State and explain the following **10**
    i.   Principle of virtual work
    ii.   Maxwell – Betti's theorem of reciprocal deflection

b) Determine the deflection at point 'C' for the beam shown in Fig 6(b) using Castigliano's theorem. Assume EI is uniform over the entire span with a value of 14000 kNm^2 **10**
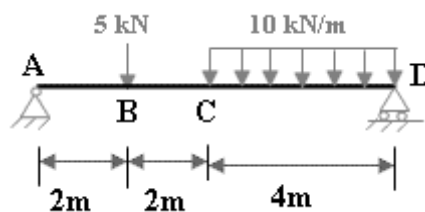

Fig. 6(b)

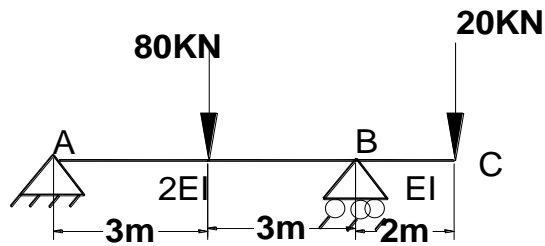7 a) Determine the deflection under 80kN load for the beam shown in Fig 7(a) by Unit load method. **10**

Fig.7(a)

b) A simply supported beam of span 6 m carries an udl of 8 kN/m over entire span along with a point load of 12 kN acting at 2m from the left end. Determine the deflection at a point located $3/4^{th}$ span from left end, using unit load method. Assume EI is constant. **10**

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