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**PRESIDENCY UNIVERSITY  
BENGALURU  
SCHOOL OF ENGINEERING**

**MAKEUP EXAMINATION- JAN 2023**

**Course Code:** MEC 220 / MEC 3005

**Course Name:** Finite Element Analysis

**Program** : B.Tech

**Date:** 30-JAN-2023

**Time:** 01:00 PM – 04:00 PM

**Max Marks:** 100

**Weightage:** 50%

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**Instructions:**

- (i) Read the questions properly and answer accordingly.
  - (ii) Scientific and non-programmable calculators are permitted
  - (iii) Question paper consists of 3 parts.
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**Part A**

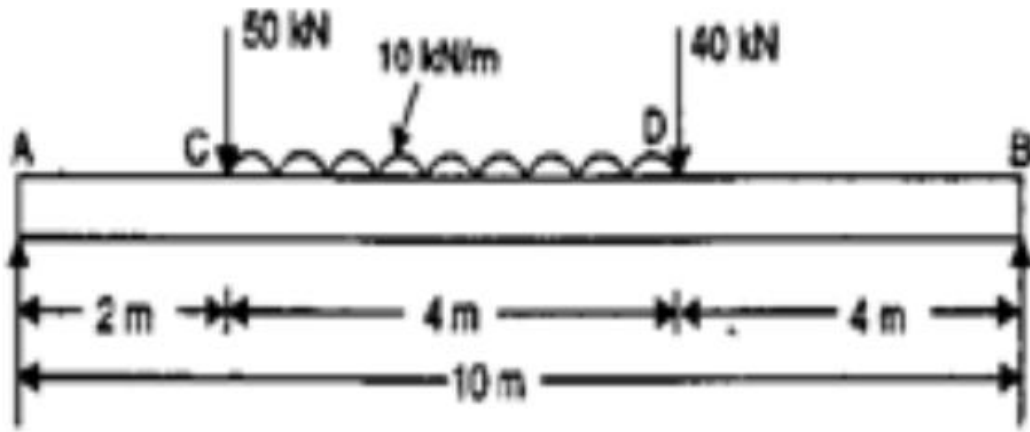
**Answer all the Questions. Each Question carries TWO marks. (5Qx2M=10M)**

- 1. Define Hooks Law along with formula? (CO1)[Knowledge]
- 2. Define Stress and Strain with appropriate Notation ? (CO2)[Knowledge]
- 3. What do you mean by Trusses? (CO3)[Knowledge]
- 4. Define Boundary Condition? (CO4)[Knowledge]
- 5. What is 3 Dimensional element? (CO5)[Knowledge]

**Part B**

**Answer all the Questions. Each Question carries TEN marks. (6Qx10M=60M)**

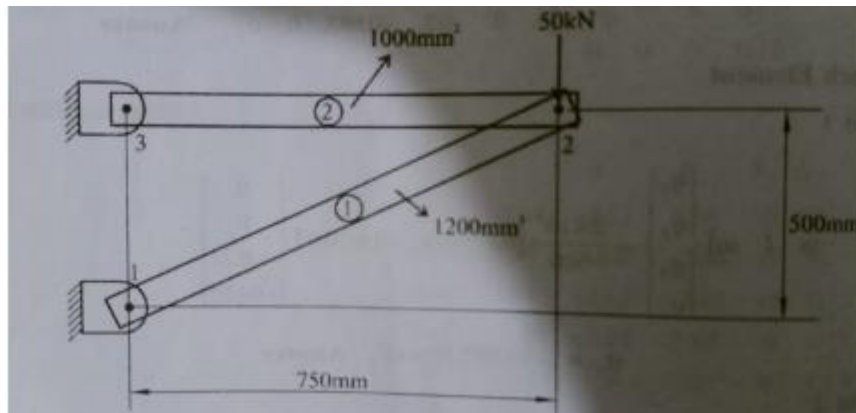
- 6. What are the advantages and Disadvantages of FEA (CO1)[Knowledge]
- 7. What are the process of FEA? Explain with neat sketch (CO2)[Knowledge]
- 8. Calculate the shear force and bending moment for the simply supported beam having uniform distributed load the span length of the beam is 4m. As shown in figure find out the reaction force for both the end. (CO3)[Knowledge]



9. Derive the stiffness matrix stress at each node and reaction support for the beam element  
(CO4)[Knowledge]

10. Outline the basic steps involved in FEM for stress analysis of an elastic body.  
(CO1)[Knowledge]

11. For the two bar truss shown in figure below determine the nodal displacement and the stress in each member. also find the support reaction, Take  $E = 200 \text{ GPa}$



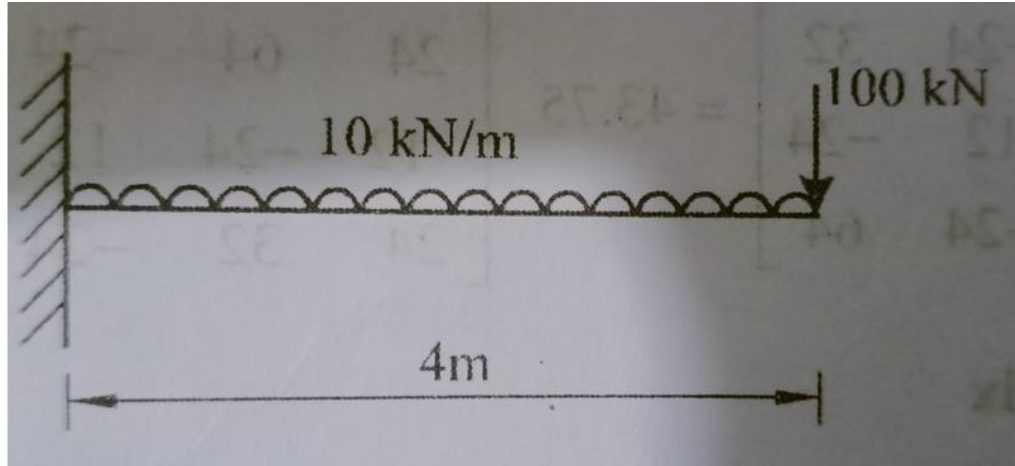
(CO4)[Knowledge]

### Part C

Answer all the Questions. Each Question carries FIFTEEN marks. (2Qx15M=30M)

12. Determine the maximum deflection in the uniform cross section of cantilever beam shown in figure below by assuming the beam as a single element find the nodal displacement.

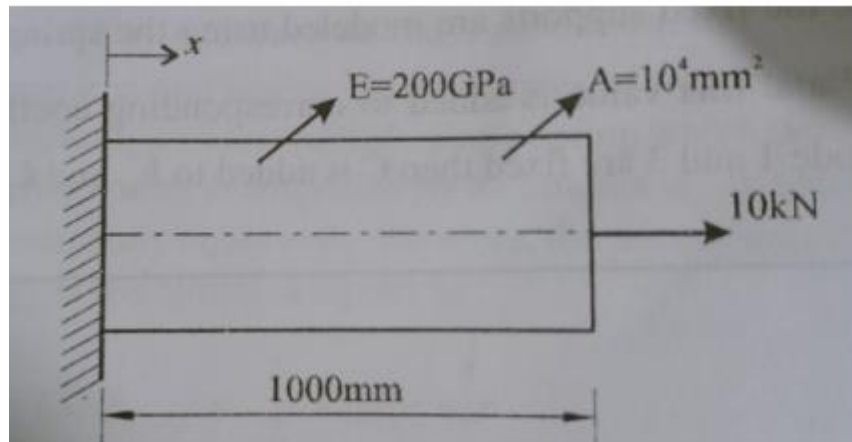
Take  $E = 7 \times 10^9 \text{ N/m}^2$ ,  $I = 4 \times 10^{-4} \text{ m}^4$ .



(CO2)[Knowledge]

13. Figure Shows a one Dimensional bar subjected to an axial loading taking it as a single bar element, determine the following

- Nodal Displacement
- Stress in each element
- Reaction at the support



(CO3)[Knowledge]