

22402

12526

4 Hours / 70 Marks

Seat No.

--	--	--	--	--	--	--	--

-
- Instructions* – (1) All Questions are *Compulsory*.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data, if necessary.
(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

- 1. Attempt any FIVE of the following :** **10**
- a) Define eccentric load with sketch.
 - b) Define slope and deflection of the beam.
 - c) State effect of continuity in continuous beam.
 - d) Define stiffness factor.
 - e) Define with equation perfect frame.
 - f) State middle third rule with sketch.
 - g) State boundary condition for simply supported beam for slope and deflection.

P.T.O.

2. Attempt any THREE of the following :**12**

- a) Define core of section. Obtain the core of section for a rectangular section.
- b) A square pillar is 500 mm × 500 mm in section. At what eccentricity a point load of 5500 kN be placed on one of the centroidal axis of the section so as to produce no tension in the section. Draw stress diagram.
- c) A square pillar 200 mm side is subjected to an eccentric load of 90 kN at an eccentricity of 50 mm in the plane bisecting thickness. Find the maximum and minimum stress at the base section.
- d) Draw stress distribution diagram for –
 - i) $\sigma_o > \sigma_b$
 - ii) $\sigma_o = \sigma_b$
 - iii) $\sigma_o < \sigma_b$

3. Attempt any THREE of the following :**12**

- a) A simply supported beam carries UDL of 4kN/m over entire span of 4 m. Find the deflection at mid span and slope at supports in terms of EI.
- b) A fixed beam AB of span 4m carries a point load of 90 kN at its centre. Find fixed end moments by using the first principle and BMD.
- c) A fixed beam of span 7 m carries a point load of 82 kN at 3m from left support. Calculate fixed end moment.
- d) Find fixed end moment, SFD an BMD for a fixed beam carrying a udl of 15 kN/m over 6 m span.

4. Attempt any THREE of the following :

12

- State Clapeyron's theorem of three moments and meaning of each terms involved for continuous beam with same MI.
- Beam ABCD is simply supported at A and D and is continuous over B and C. Determine distribution factors.
($AB = BC = CD = 6\text{m}$) ($I_{AB} = I$, $I_{BC} = 2I$, $I_{CD} = 1.5I$)
- Define and sketch redundant and defficient frame.
- For the beam shown in Fig No. 1. Calculate moment at B using three moment theorem.

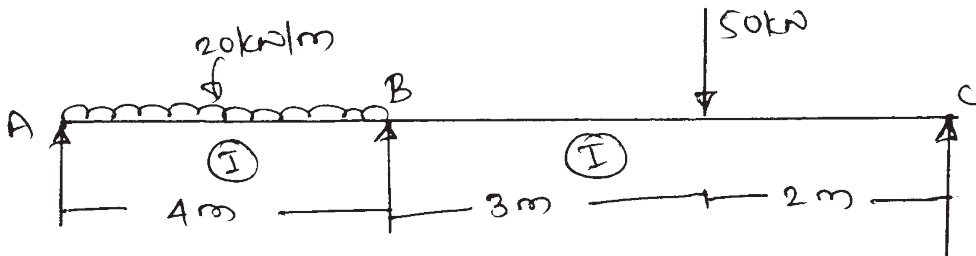


Fig. No. 1

- A beam ABC is simply supported at A, B and C span AB and BC are of lengths 3 m and 4 m respectively. AB carries udl of 15kN/m over entire span and BC carries a central point load of 30 kN. Find support moment using MDM.

5. Attempt any TWO of the following :

12

- Find the slope and deflection at the centre of a simply supported beam as shown in Fig. No. 2. Take $EI = 4000 \text{ kNm}^2$ use Macaulay's method.

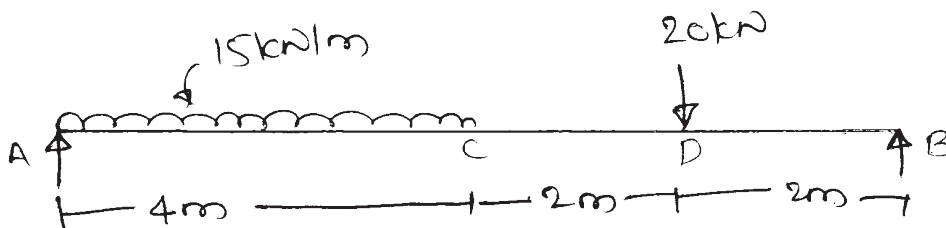


Fig. No. 2

- b) Find the support moments for the continuous beam shown in Fig. No. 3 using Clapeyron's theorem of three moments.

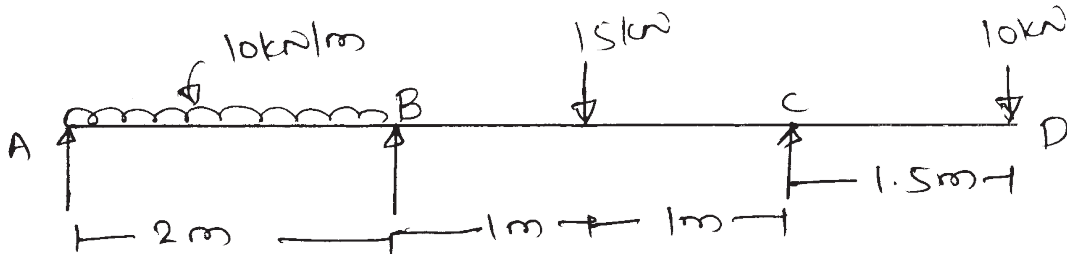


Fig. No. 3

- c) A cantilever beam of 3 m span is subjected to a udl of 3 kN/m over entire span and a point load of 4 kN at 2 m from the free end. Calculate the slope and deflection under the point load. Consider $E = 210 \text{ GPa}$ and $I = 2.85 \times 10^8 \text{ mm}^4$.

6. Attempt any TWO of the following :

12

- a) A continuous beam of uniform rigidity is fixed at A and simply supported at B and C. $AB = 6 \text{ m}$ and carries udl of 40 kN/m. Span $BC = 8 \text{ m}$ and carries 80 kN point load at its mid-span. Using MDM calculate the support moment and draw BMD.
- b) Using method of joints, Find the nature and magnitude of forces in AE and DE in frame as shown in Fig. No. 4.

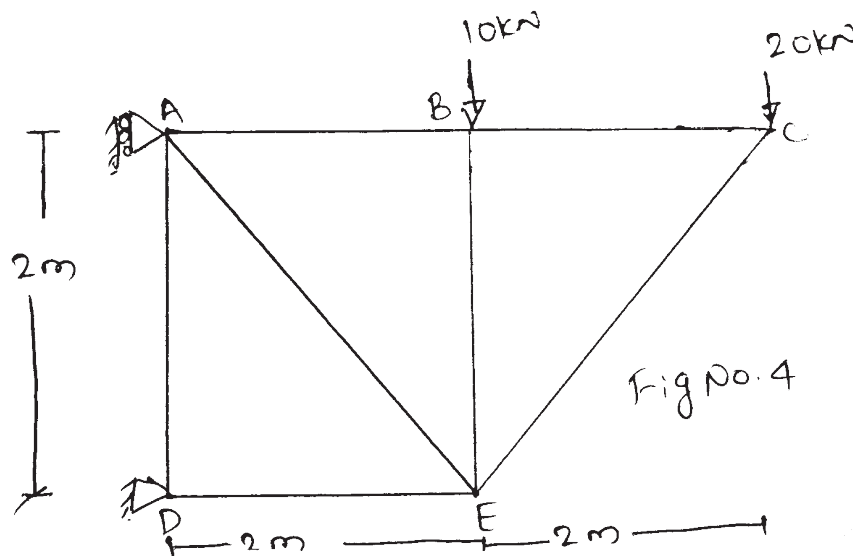


Fig. No. 4

22402

[5]

Marks

- c) Using method of section. Find the forces in the member BC, BE and FE of the frame as shown in Fig. No. 5

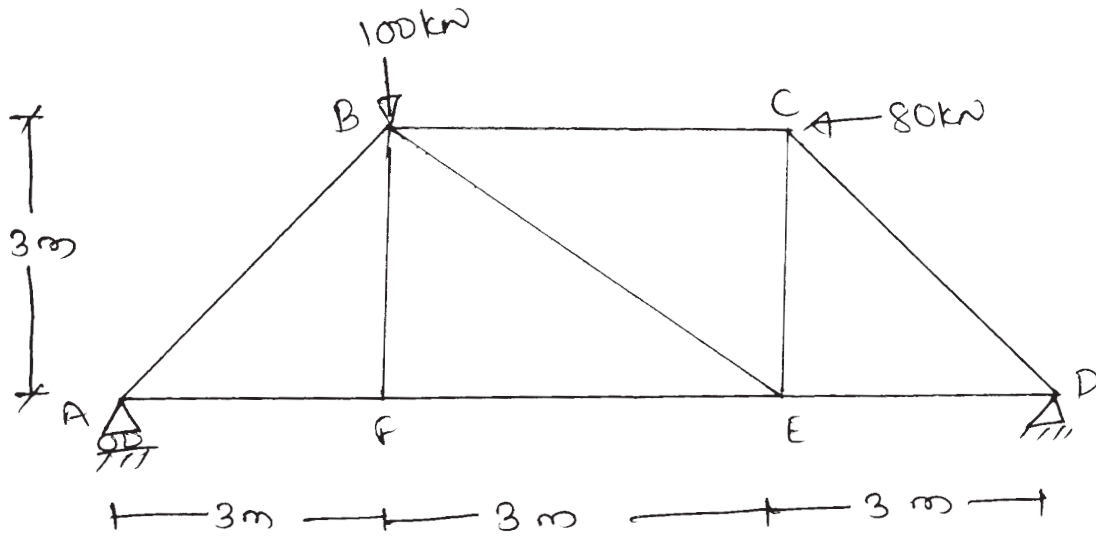


Fig. No. 5