

Seat
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मजल - 012

Theory of Structure - I (1070)

P. Pages : 4

Time : Three Hours

Max. Marks : 100

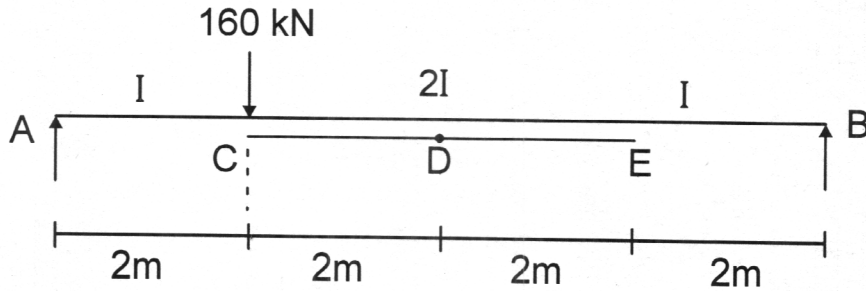
Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **only two** questions from each unit.
5. Figures to the right indicates full marks.
6. Use of non programmable calculator is allowed.
7. Assume suitable data if necessary.

UNIT - I

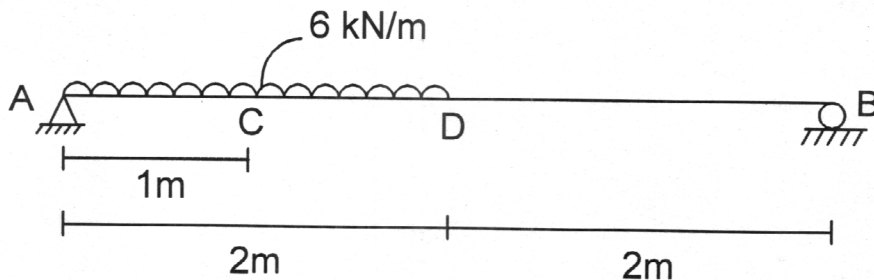
1. a) Determine slope at A, B, C, E and deflections at C and D in the beam. Use conjugate beam method.

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- b) A beam carries an UDL of 6 kN/m as shown. By moment area method. Find the deflection at C and D. Take $E = 10 \text{ GPa}$ & $I = 66.67 \times 10^6 \text{ mm}^4$

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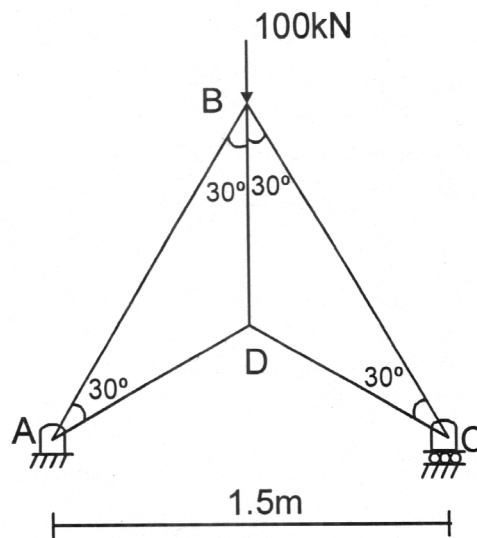


c) i) Explain Castigliano's Ist and IInd theorem. 5

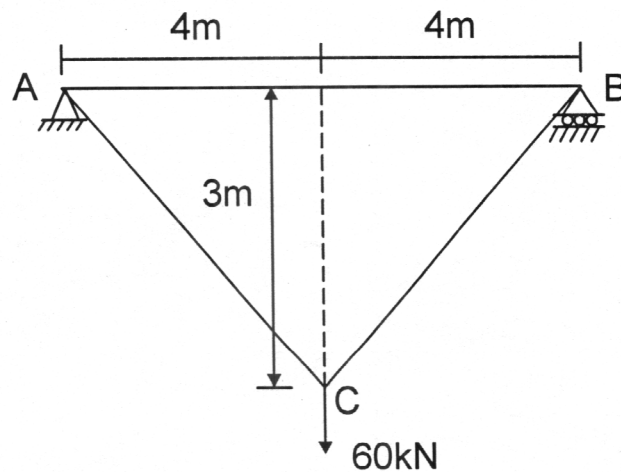
ii) Explain First and Second moment area theorem. 5

UNIT - II

2. a) A symmetrical frame of 1.5m span is hinged at A and is supported on rollers at C. The frame is carrying a load of 100kN at B. The c/s area of members AB and BC is 1000mm^2 . While that of members AD, BD and CD is 500mm^2 . Determine horizontal deflection at jt. 'C'. Take $E = 200\text{GPa}$. 10

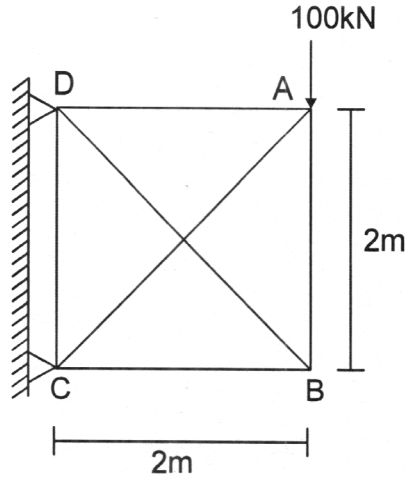


- b) Find the vertical as well as horizontal deflection at 'C'. Take area of member AB as 1000mm^2 and those of member AC & BC as 1500mm^2 . $E = 200\text{ GPa}$. 10



- c) Find forces in all the members. The c/s area and E are same for all the members.

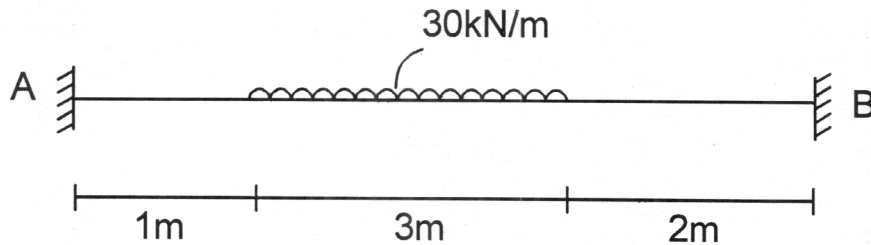
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UNIT - III

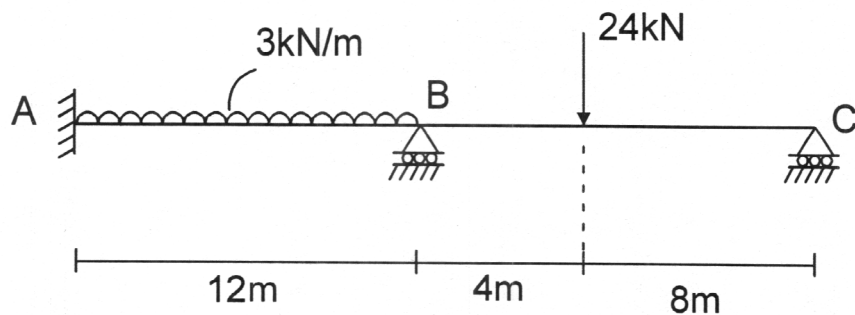
3. a) The beam AB of span 6m is subjected to a UDL of 30 kN/m as shown. Find fixed end moments. Draw B. M. D.

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- b) The support B sinks by 30 mm for beam shown. Calculate the support moments and Draw B. M. D. and S. F. D. Take $E = 200 \text{ GPa}$ and $I = 0.2 \times 10^9 \text{ mm}^4$.

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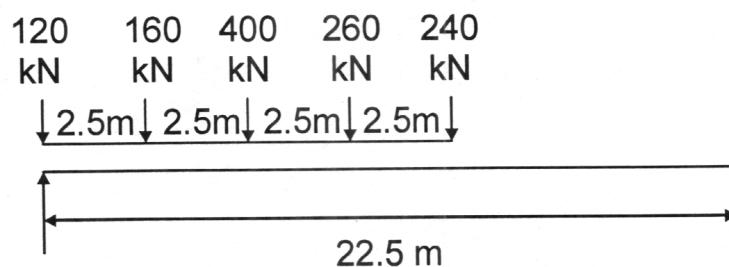


- c) A fixed beam AB of span 4m is carrying a UDL of 15 kN/m. The support B sinks down by 10 mm. Determine the fixing moments at A and B. Take $E = 200 \text{ GPa}$ & $I = 8 \times 10^6 \text{ mm}^4$.

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UNIT - IV

4. a) A three hinged circular arch of span 16m and rise 4m is subjected to two point loads of 100kN and 80 kN at the left and right quarter span points respectively. Find reactions at supports. Find also the Bending moment, radial shear and normal thrust at 6m from left support. 10
- b) A parabolic arch hinged at the ends has a span of 60m and rise of 12m. A concentrated load of 8 kN acts at 15m from the left hinge. The second moment of area varies as the secant of the inclination of the arch axis. Calculate horizontal thrust. Also calculate net bending moment at the section (under the load). 10
- c) A three hinged parabolic arch has a span of 30m and a central rise of 6m. Five wheel loads of 4,5,5,3,3 kN spaced 3m, 2m, 3m and 2m in order cross the arch from left to right with the 4kN load leading. When the leading load is 20m from the left hinge. Calculate the horizontal thrust in the arch. Also calculate the B. M. under the tail load. 10
5. a) Four equal loads of 150 kN each equally spaced at 2m apart followed by a UDL of 60 kN/m at a distance of 1.5m from the last 150 kN load cross a girder of 20m span from right to left. Using ILD, calculate the S. F. and bending moment at a section 8 m from left hand support when the leading 150 kN load is at 5 m from left hand support. 10
- b) A train of 5 wheel loads crosses a simply supported beam of span 22.5 m. Using influence lines, calculate absolute maximum bending moment anywhere the span. 10



- c) i) What do you mean by ILD ? State its uses. 4
- ii) Explain condition for maximum B. M. at a section for wheel load. 6
