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# Theory of Structures - I
## (1070)

**P. Pages : 5**

**Time : Three Hours** **Max. Marks : 100**

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answer sheet 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. Attempt **any 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 wherever necessary.

### UNIT – I

**1.** Determine the central deflection and slope at supports for simply supported beam shown in fig.(1) by moment area method. Take $E = 2.1\times10^5$ MPa & $I = 3\times10^7\ mm^4$ **10**

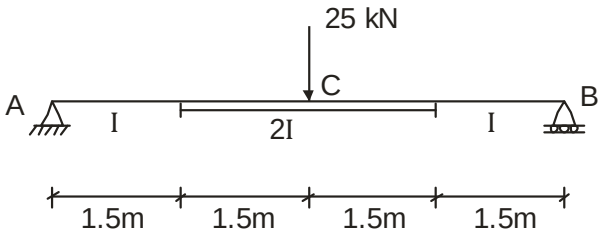


Fig. 1

**2.** Find slope at supports and deflections at C and D for the simply supported beam shown in fig.2 By conjugate beam method Take $E = 2\times10^5$ MPa $I = 4\times10^7\ mm^4$. **10**

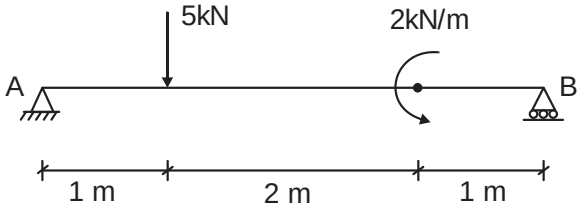


Fig. 2

**3.** A simply supported beam of span 6m carries a udl of 20 kN/m over left half of the span using unit load method calculate deflection at midspan. $EI = 16000 kN/m^2$. **10**

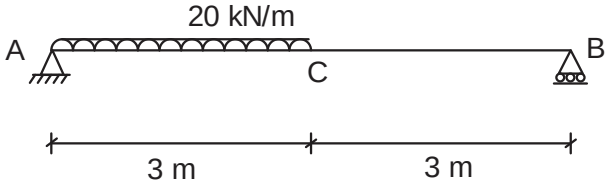


Fig. 3

## UNIT – II

**4.** Find the horizontal and vertical deflections at joint C of a contilever truss shown in fig. (4) All members have equal area of 2000 $mm^2$ E = 200 GPa. **10**

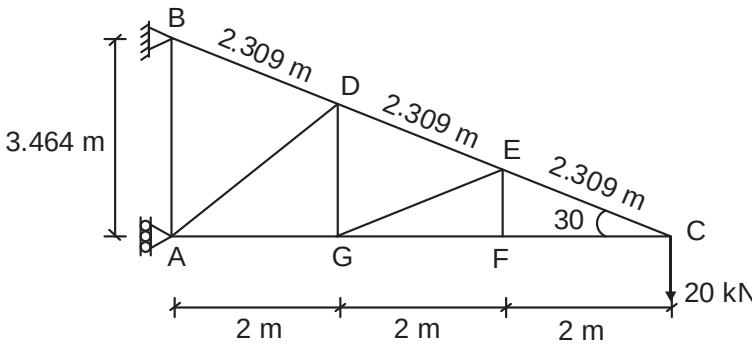


Fig. 4

**5.** A framed structure is loaded as shown in fig.(5). Find the vertical deflection of the joint-D if **10**

a) area of all horizontal members = $5 \times 10^{-4} m^2$

b) area of all vertical members = $1 \times 10^{-4} m^2$

c) area of all inclined members = $5.6 \times 10^{-4} m^2$

and $E = 2 \times 10^8$ kPa

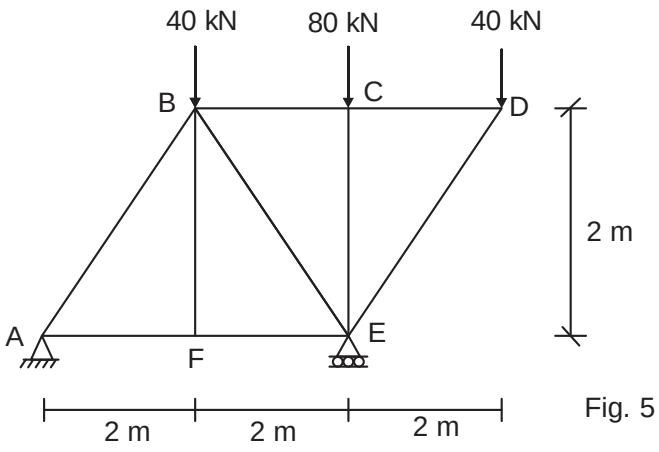


Fig. 5

**6.** Analyse the truss supported and loaded as shown in fig. (6) cross sectional area of each member in $cm^2$ is indicated in brackets Take E = constant. **10**

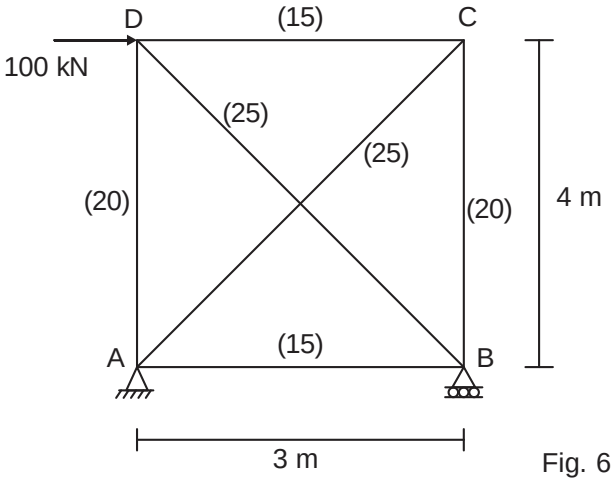


Fig. 6

## UNIT - III

**7.** A beam ABCD simply supported at A continuous over supports B and C and fixed at D carries a loads as shown in fig.(7). Determine how much the support B is to be raised or lowered to make the bending moment at B zero. Draw the BMD take $EI = 1.2 \times 10^4\ kN.m^2$ **10**

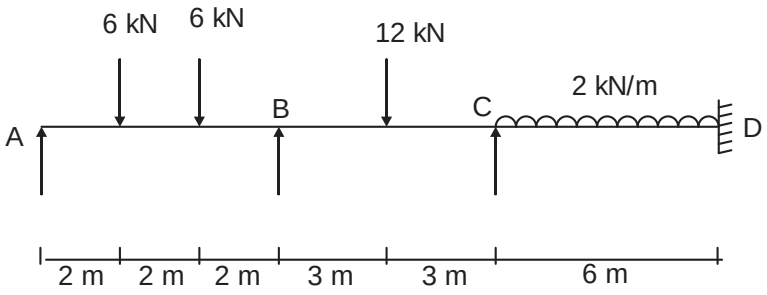


Fig. 7

**8.** A fixed beam of span 'L' carrying uvL of zero at one end and w/m at 'a' from A i.e. over the part of span. Determine fixed end moments at supports & plot BMD. **10**

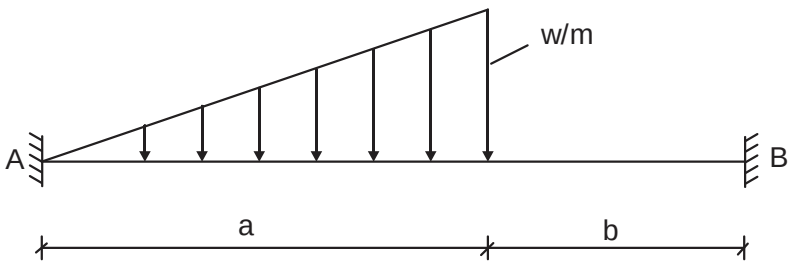


Fig. 8

**9.** A beam of span 4m is fixed at both ends A and B if carries a concentrated load of 20kN at C 1 m from A. It also carries an anticlockwise moment of 60 kN m at D 3m from A. Compute the fixed end moments draw B.M.D. **10**

## UNIT – IV

**10.** A three hinged parabolic arch hinged at the supports and at the crown has a span of 24m and central rise of 4m it carries concentrated loads of 50 kN at 18m from left support and udl of 30 kN/m over left half portion. Determine the moment thrust and radial shear at a section 6m from the left support A. **10**

**11.** A two hinged parabolic arch of span 'L' and rise 'h' carries a concentrated load 'w' at the crown. Determine the expression for horizontal thrust developed at springings. **10**

**12.** A two hinged parabolic arch is loaded as shown in fig.(9) determine the **10**

i) horizontal thrust.
ii) maximum positive and negative moments.
iii) shear force and normal thrust at 10m from the right support.

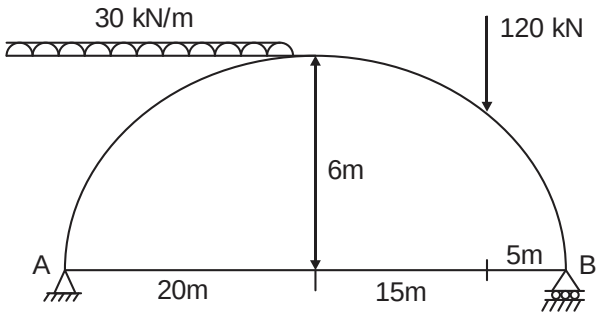


Fig. 9

## UNIT - V

**13.** Using influence line diagrams determine the shear force and bending moment at section 4m from A in the simply supported beam shown in fig.10. **10**

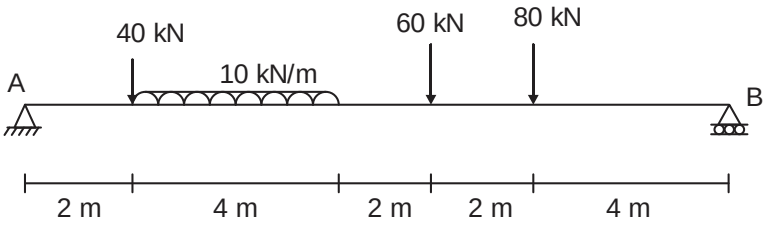


Fig. 10

**14.** A simply supported beam has a span of 15m uniformly distributed load of 40 kN/m and 5m long crosses the girder from left to right. Draw the influence line diagram for shear force and bending moment at a section 6m from left end. Use theatre diagrams to calculate the maximum shear force and bending moment at this section. Determine the position and magnitude of absolute maximum bending moment in the beam. Ref. fig.(11). **10**

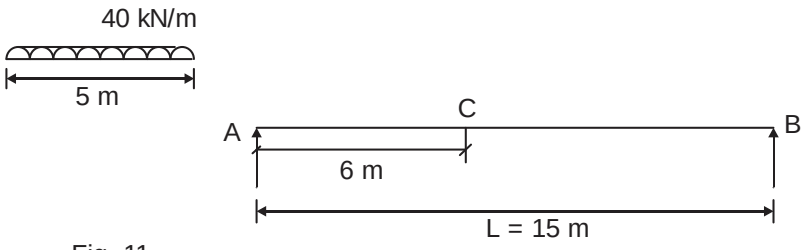


Fig. 11

**15.** The system of concentrated loads shown in fig.(12) rolles from left to right on a girder of span 15m. 40 kN load leading for a section 4m from left support, determine **10**

i) maximum bending moment.
ii) maximum shear force.

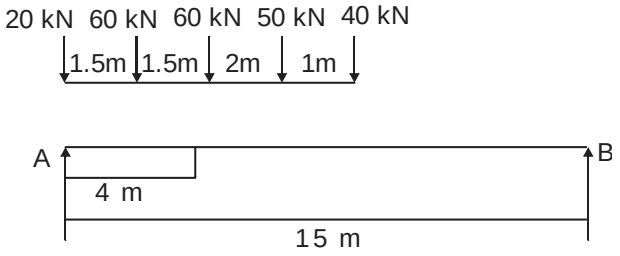


Fig. 12

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