

Theory of Structure (315313)

MSBTE Diploma · K-Scheme · Model Question Paper — Set A

Time: 4 Hours

Max. Marks: 70

Instructions:

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Use of non-programmable electronic pocket calculator is permissible.
7. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:

10

- a) Define slope and deflection of a beam. Draw a neat sketch.
- b) Define fixed beam.
- c) Define stiffness factor and distribution factor.
- d) Define perfect frame with a neat sketch.
- e) State any two effects of continuity on a continuous beam.
- f) Enlist any four types of trusses.
- g) Define point of contraflexure.

Q.2 Attempt any THREE of the following:

12

- a) A simply supported beam of span 5 m carries a UDL of 12 kN/m over the entire span. Using standard formulae, find the maximum slope and maximum deflection. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 8 \times 10^7 \text{ mm}^4$.
- b) A cantilever of span 2 m carries a point load of 20 kN at its free end. The section is rectangular, 150 mm wide and 300 mm deep. Find the slope and deflection at the free end. Take $E = 20 \text{ kN/mm}^2$.
- c) A simply supported beam AB of span 6 m carries point loads of 30 kN and 20 kN at 2 m and 4.5 m from A respectively, as shown in Fig. No. 1. Using Macaulay's method, find the deflection under each load in terms of EI.

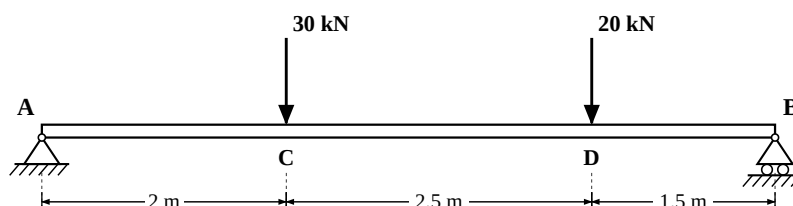


Fig. No. 1

- d) State the boundary conditions for (i) simply supported beam, (ii) cantilever and (iii) fixed beam.

Q.3 Attempt any THREE of the following:

12

- a) State any two advantages and two disadvantages of a fixed beam over a simply supported beam.
- b) Calculate the fixed end moments and draw the BMD for the fixed beam shown in Fig. No. 2.

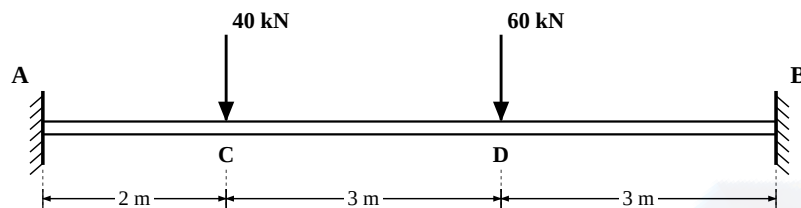


Fig. No. 2

- c) State and explain Clapeyron's theorem of three moments.
- d) Explain the principle of superposition with a suitable example.

Q.4 Attempt any THREE of the following:

12

- a) A continuous beam ABC is simply supported at A, B and C as shown in Fig. No. 3. Using the theorem of three moments, find the support moment at B and draw the BMD.

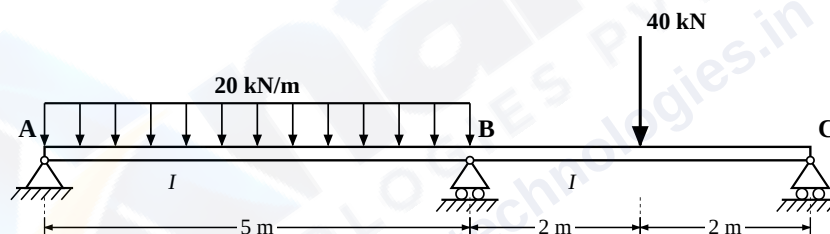


Fig. No. 3

- b) A beam ABCD is fixed at A, simply supported at D and continuous over supports B and C. $AB = 4\text{ m}$, $BC = 6\text{ m}$, $CD = 5\text{ m}$; $I_{AB} = I$, $I_{BC} = 2I$, $I_{CD} = I$. Calculate the distribution factors at all joints.
- c) Differentiate between symmetrical and unsymmetrical portal frames with neat sketches (any four points).
- d) State the methods of analysis of a perfect frame and explain the method of sections.
- e) Explain the concept of imaginary span used in the theorem of three moments.

Q.5 Attempt any TWO of the following:

12

- a) A continuous beam ABC is fixed at A and simply supported at B and C as shown in Fig. No. 4. Using Clapeyron's theorem of three moments, find the support moments and draw the SFD and BMD.

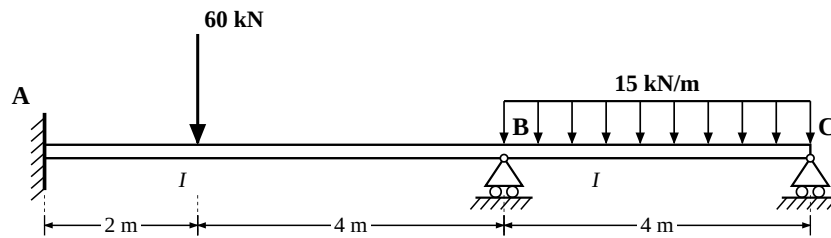


Fig. No. 4

- b) A simply supported beam of span 7 m carries a UDL of 10 kN/m over the whole span and a point load of 40 kN at 2.5 m from the left support A. Using Macaulay's method, locate the point of maximum deflection and find its value. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 1.5 \times 10^8 \text{ mm}^4$.
- c) Using the moment distribution method, find the support moments and draw the BMD and SFD for the beam shown in Fig. No. 5. EI is constant.

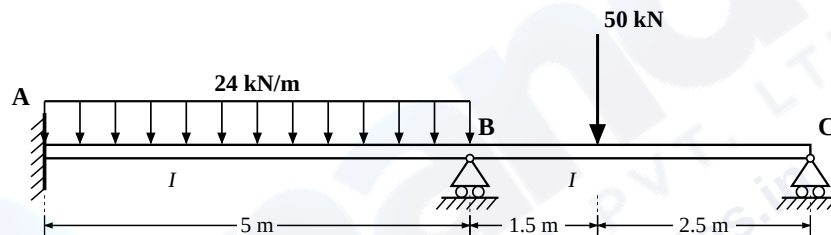


Fig. No. 5

Q.6 Attempt any TWO of the following:

12

- a) A continuous beam ABCD is simply supported at A and D and continuous over B and C, loaded as shown in Fig. No. 6. Using the moment distribution method, find the support moments and draw the BMD.

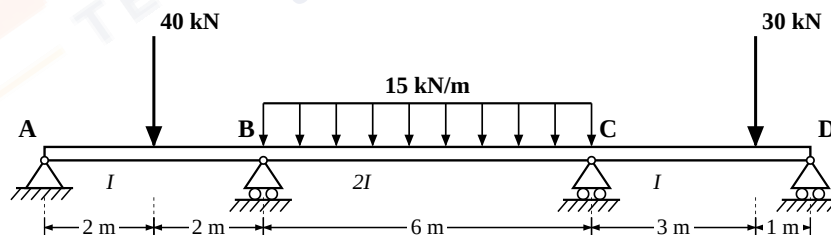


Fig. No. 6

- b) Determine the support reactions and the magnitude and nature of forces in all the members of the truss shown in Fig. No. 7 using the method of joints. (All triangles are equilateral.)

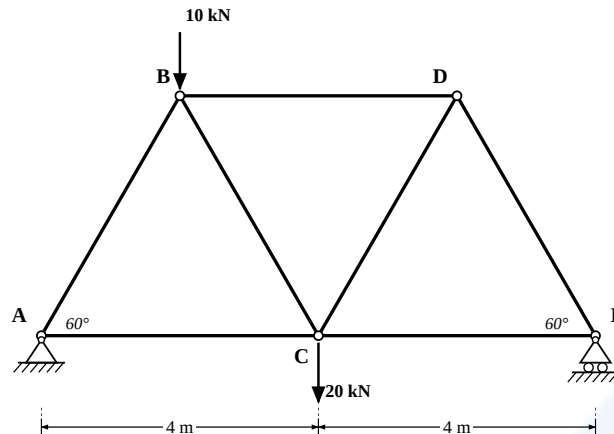


Fig. No. 7

- c) Using the method of sections, find the forces in members FG, FC and BC of the Pratt truss shown in Fig. No. 8. State their nature.

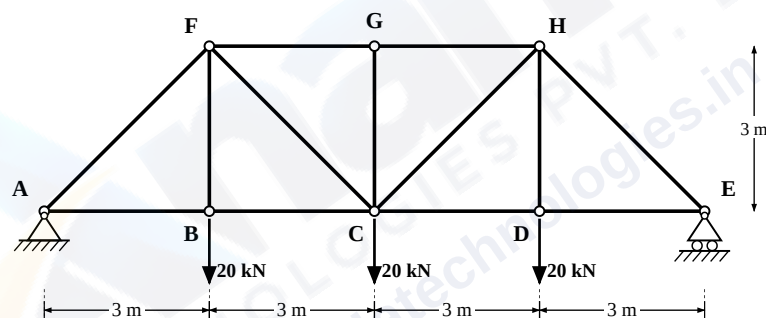


Fig. No. 8

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in