

1735

October 2024

Time – Three hours
(Maximum Marks: 100)

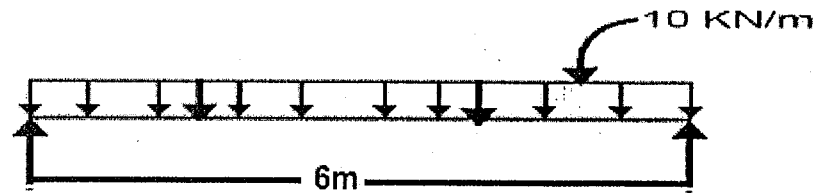
[N.B. Answer all the questions, choosing any two subdivision from each question. Each subdivision carries 10 marks.]

1. (a) Explain any five mechanical properties of materials.
(b) A rod 1m long and 20mm x 20mm in cross section is subjected to a pull of 98kN. If the modulus of elasticity of the material is 2×10^5 N/mm². Determine the elongation of the bar.
(c) A rectangular wooden column of length 3m and 300mm x 200mm carries an axial load of 300 kN. The column is found to be shortened 1.5 mm under the load. Find the Young's modulus of the column.
(d) Find the bulk modulus and shear modulus of a material having Young's modulus of 2×10^5 N/mm² and Poisson's ratio as 0.3.

2. (a) Explain the types of beams based on support conditions with neat diagrams.
(b) A cantilever of 4m length is fixed at the left end. It carries udl of 10kN/m acts throughout its length. Draw SFD and BMD for the beam.
(c) A simply supported beam of span 8m carries a central point load of 10kN. Draw SFD and BMD.

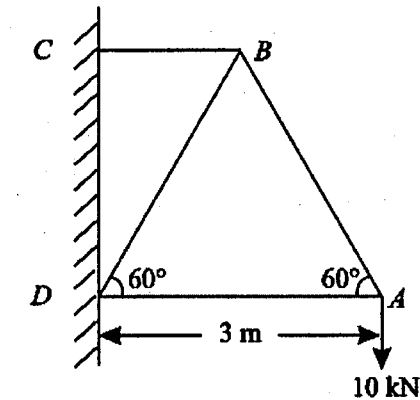
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- (d) Construct the shear force and bending moment diagram for the simply supported beam as shown in fig.



3. (a) A steel beam of I section has the following details, Top flange = 75mm x 12mm, Bottom flange = 75mm x 12mm, web = 125mm x 8mm. Find the centre of gravity of I section.
- (b) (i) Sketch the various types of asymmetrical section. (5)
 (ii) Define radius of gyration. State their values for rectangular and solid circular sections. (5)
- (c) Determine the moment of inertia of T section with flange 50mmx10mm and web 60mmx10mm about the centroidal axis.
- (d) Find the section modulus of hollow circular section having outer diameter as 300mm and inner diameter as 200 mm.
4. (a) A simply supported beam of 6m span carries a point load of 40kN at its centre. Its cross section is a rectangle of section of 300mm x 400mm. Determine the maximum bending stress.
- (b) (i) Define bending stress. Also explain the theory of simple bending. (5)
 (ii) Define section modulus and flexural rigidity. (5)
- (c) Determine the maximum moment of resistance of rectangular beam having cross section of 300mm x 400mm, if the bending stress not exceeding 5N/mm^2 .
- (d) A metallic rod of 10 mm diameter is bent into a circular form of radius 6 m. If the maximum bending stress developed in the rod is 125 MPa, find the value of Young's modulus for the rod material.

5. (a) What is a 'frame' ? Also explain its classification with neat diagrams.
- (b) Define the following: Rafters, Ties, Slings.
- (c) Find the magnitude and nature of forces in the cantilever truss as shown in fig. by method of joints.



- (d) Determine the magnitude and nature of forces in the members of truss as shown in fig. by method of joints.

