



No. of Pages : 6

Code : ESM-3
Subject : CIVIL ENGINEERING – 1
Question Paper

Time : 3 Hours

Max. Marks : 200

- Q. 1. Briefly describe the method used for determining the compressive strength of bricks. 5
- Q. 2. Discuss briefly the factors affecting the strength of timber. 5
- Q. 3. Determine the reaction at the supports A and B of a bar supported at both ends by the fixed support. The bar is loaded with axial force P, which acts at an intermediate point C, as shown in Fig. 1. Assume $AE = \text{constant}$ throughout the length. 5

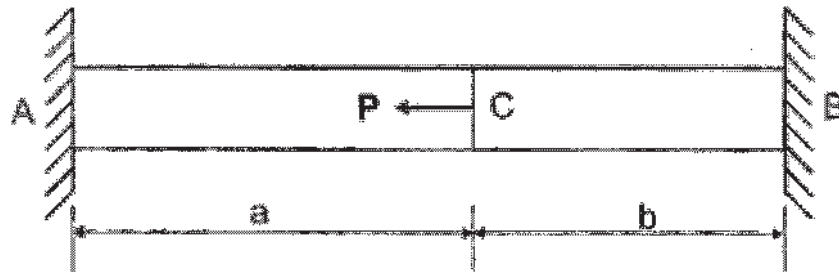


Fig. 1

- Q. 4. Consider an elemental block subjected to uniaxial tension, as shown in Fig. 2. Derive an approximate expression for the change of volume due to this loading. Also comment on the type of change in the volume. 5

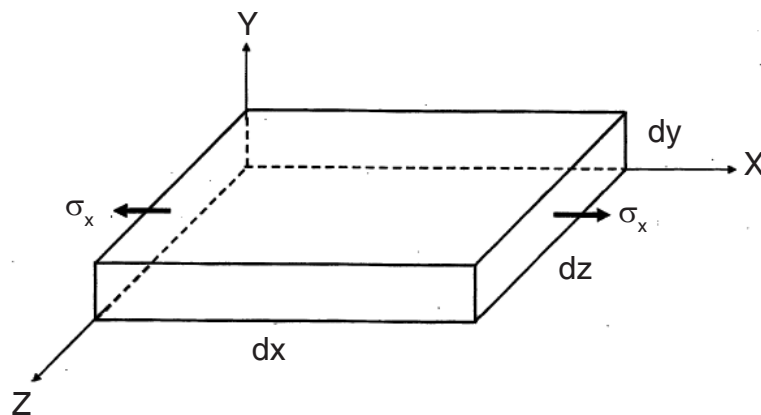


Fig. 2



Q. 5. Calculate the degree of static indeterminacy of the structure shown in Fig. 3. 5

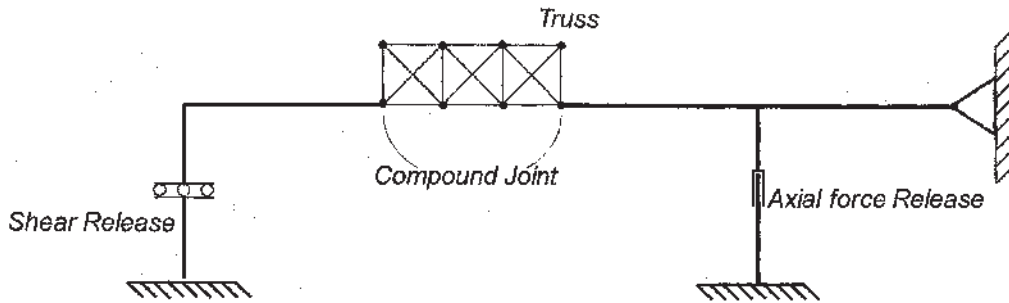


Fig. 3

Q. 6. Draw the Bending Moment Diagram of a beam from the Shear Force Diagram shown in the Fig. 4. 5

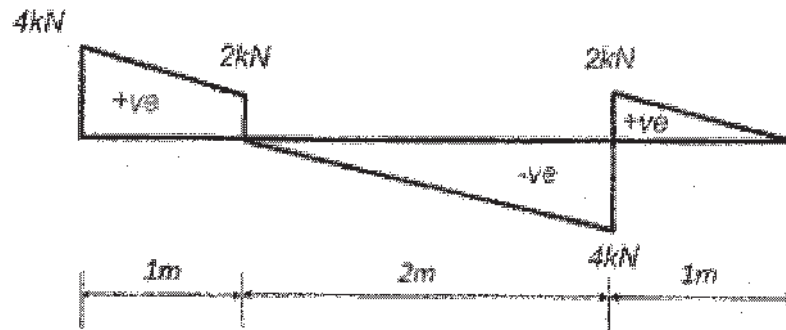


Fig. 4

- Q. 7. What are the differences between Reinforced Cement Concrete and Prestressed Concrete ? 5
- Q. 8. Explain how a 'tremie' is used to place concrete under water ? 5
- Q. 9. What is the minimum percentage of steel in beam, slab and column as per IS 456-2000 ? Why the minimum percentage limit is different for different members ? 5
- Q. 10. In an earthquake prone area, existing building is having the following configuration: 5
- (a) Soft storey frame
 - (b) Weak column – strong beam.

Write down problem associated with such configuration and its remedial measures.



- Q. 11. During a building construction M 25 concrete was used. To ensure regular quality control 4 cubes were casted for each day work, cured and tested on 28th day their compressive strength which are 31 MPa, 21 MPa, 29 MPa and 30 MPa. Stating the provisions of IS 456 : 2000, recommend the acceptance or rejection of the concrete. 5
- Q. 12. What is a Composite Beam ? Explain the purpose of shear connector in a composite beam. 5
- Q. 13. What are the principal constituents of brick earth and how do they influence the quality of bricks ? 10
- Q . 14. Draw the Stress-Strain Curves for a timber member under tension, compression and bending parallel to gravity. Discuss the importance of compression test results. 10
- Q. 15. Define 'Workable Concrete'. Enlist the various tests commonly used for measuring the workability of concrete. State the merits and limitations of Slump Test. What slump values are recommended for different types of works ? 10
- Q. 16. A circle of diameter 100 mm is marked on a steel plate. The circle deforms in an ellipse when the plate is subjected to forces as shown in Fig. 5. Determine the major and minor axes of the ellipse and their location, if $E = 200 \text{ GPa}$ and $\mu = 0.3$. 10

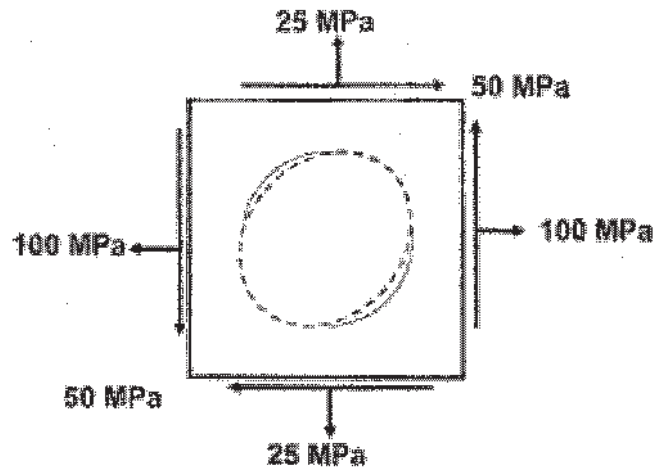


Fig. 5



- Q. 17. A reinforced concrete beam has simply supported span of 6.4 m. The beam carries super imposed load of 13 kN/m including dead load. Design the beam with width 300 mm at mid span only for flexure and shear at limit state of collapse. Take Grade of steel as Fe 415 and Grade of concrete as M 25. 10
- Q. 18. What is Web Buckling and Web Crippling in a beam member ? Why rolled section generally do not show diagonal buckling ? Explain with the help of a neat sketch. 10
- Q. 19. The beam is loaded with concentrated loads as shown in Fig. 6. If the loads are moving from left to right, compute the maximum moment at section C. 10

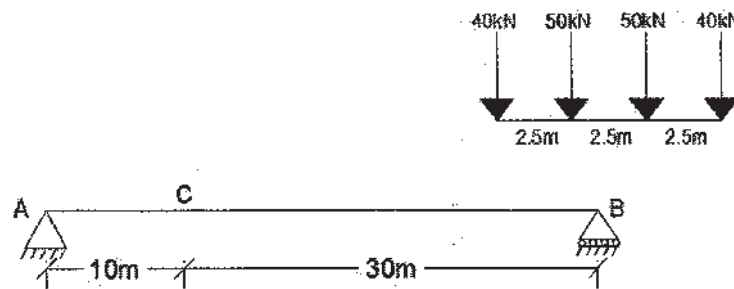


Fig. 6

- Q. 20. A bracket plate is welded to the flange of a column of section ISHB 300 @ 618 N/m as shown in Fig. 7. Calculate the size of the weld to support a load of 110 kN. Assume permissible stress in the weld as 108 MPa. 10

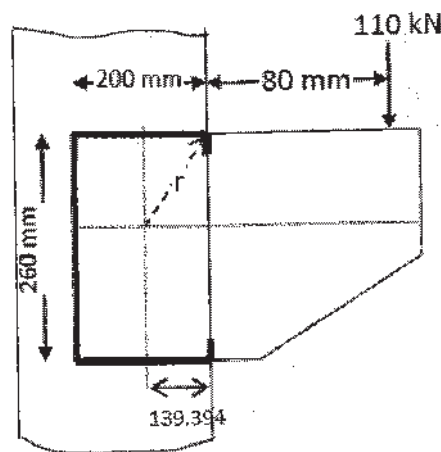


Fig. 7



Q. 21. Analyse the triangular frame shown in Fig. 8 by Matrix Stiffness method. Take $A = 200 \text{ mm}^2$ and $E = 2 \times 10^5 \text{ N/mm}^2$.

15

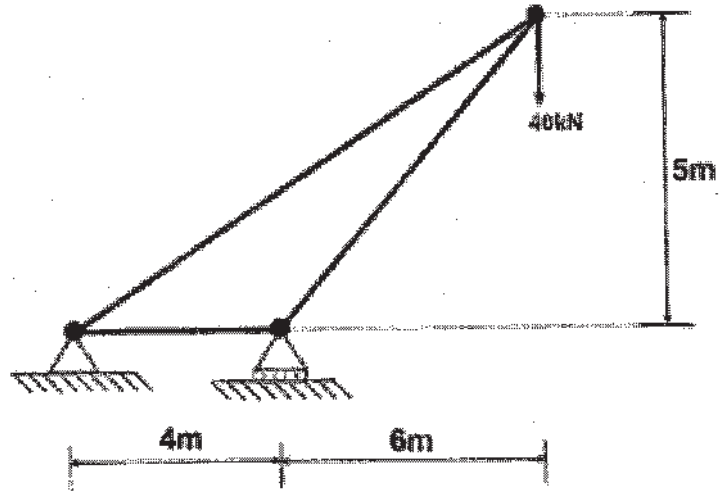


Fig . 8

Q. 22. Find out the fully plastic moment in the portal frame as shown in Fig. 9. The frame has uniform cross section throughout. For what value of L sway mechanism M_p will be greater than the combine mechanism M_p .

15

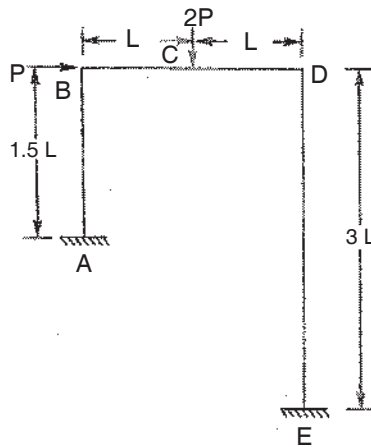


Fig. 9



- Q. 23. Two wheels, placed at a distance of 2.5 m apart, with a load of 100 kN on each of them, are moving on a simply supported girder (I-section) of span 6.0 from left to right. The top and bottom flange of I Section are 200×20 mm and size of web plate is 800×6 mm. If the allowable bending compressive, bending tensile and average shear stress are 110 MPa, 165 MPa and 100 MPa respectively, check the adequacy of the section against bending and shear stress. Neglect the self weight of the girder. **15**
- Q. 24. Design a circular column of diameter 400 mm subjected to a working load of 1500 kN. The column has an unsupported length of 3.2 m and held at both ends but not restrained against rotation. Use limit state of design where Grade of concrete is M 25 and Grade of steel is Fe 415. Design both spiral and longitudinal reinforcement in the column. **15**
-