

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt five questions in all, select one question each from section A, B, C, D. Section E (Question-9) is compulsory.

**SECTION-A**

1. (a) What are the key differences between statically determinate and statically indeterminate structures? (6)
- (b) What are Maxwell's reciprocal theorems and their significance in structural analysis? (6)

OR

2. (a) What are the key assumptions made when analysing plane trusses using these methods? (6)
- (b) Determine the forces in members DE and DC in the truss shown in Figure 1 below. The magnitude of the three applied forces is indicated in brackets. (6)

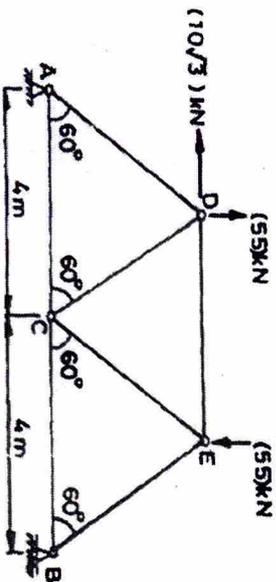


Figure 1

**SECTION - B**

3. (a) Why is it important to determine slopes and deflections in structural beams? (6)
- (b) How does the Conjugate Beam Method differ from other deflection analysis methods? (6)

OR

4. Analyze continuous beam ABCD as shown in Figure 2 by slope deflection method, then draw bending moment diagram. Take EI Constant. (12)

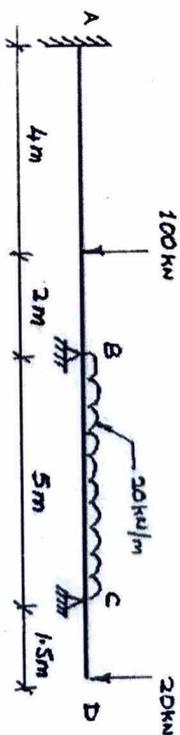


Figure 2

**SECTION - C**

5. (a) What are the key characteristics of arches in structural engineering? (6)
  - (b) How does a three-hinged parabolic arch differ from a circular arch in terms of structural behaviour? (6)
- OR
6. (a) What is the concept of radial shear and how does it affect the stability of arches? (4)

[P.T.O.]

- (b) A three-hinged circular arch hinged at the springing and crown points has a span of 40 m and a central rise of 8 m. It carries a uniformly distributed load 20 kN/m over the left-half of the span together with a concentrated load of 100 kN at the right quarter span point. Find the reactions at the supports, normal thrust and shear at a section 10 m from left support. (8)

### SECTION - D

7. (a) Explain the Muller-Breslau principle and its significance in influence line diagrams (ILD). (4)
- (b) Two point loads of 100 kN and 200 kN spaced 3 m apart cross a girder of span 12 m from left to right with the 100 kN leading. Draw the ILD for shear force and bending moment and find the values of maximum shear force and bending moment at a section 4 m from the left hand support. Also evaluate the absolute maximum bending moment due to the given loading system. (8)

OR

8. (a) What are the effects of a uniformly distributed load that is longer than the span of a beam? (6)
- (b) What is the impact of a series of point loads on a beam's shear force and bending moment? (6)

### SECTION - E (Compulsory)

9. (i) What is a statically determinate plane truss, and how is it analyzed? (2)
- (ii) Why is it important to determine slopes and deflections in structural beams? (2)
- (iii) How are influence line diagrams (ILD) used in analyzing moving loads? (2)

- (iv) What are the forces acting on anchor cables in suspension bridges? (2)
- (v) How do moving loads affect the shear force distribution in beams? (2)
- (vi) What is the concept of influence lines in structural analysis? (2)