

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 0025**Roll No. 

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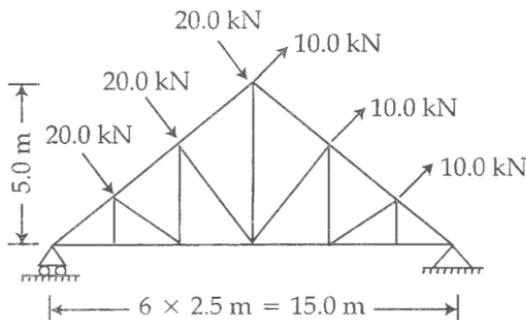
**B.Tech.**(SEM IV) EVEN SEMESTER THEORY EXAMINATION,  
2009-2010**STRUCTURAL ANALYSIS - I**

Time : 3 Hours

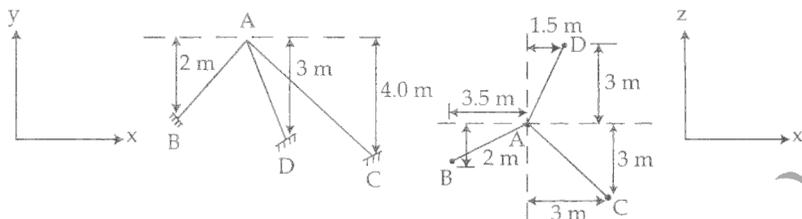
Total Marks : 100

**Note :** (i) Attempt *all* the questions.(ii) Each questions carry *equal* marks. -1. Attempt **any four** of the following :

- (a) What is the degree of static indeterminacy in trusses ? Explain with example ?
- (b) What are the different methods of analysis of trusses ? Explain.
- (c) Discuss the concept of the method of tension coefficient, and explain why it is preferred to analyse space trusses ?
- (d) Determine the member forces in the following truss.



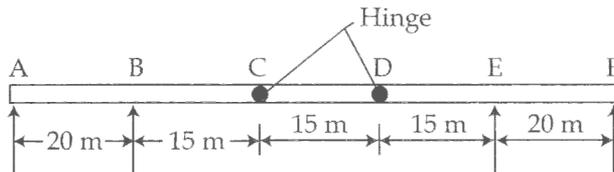
- (e) Discuss the method of section for analysis of truss, and its limitations.
- (f) Find the member forces in the space truss given below.



2. Attempt any four of the following :

- (a) Prove that "when a system of point loads crosses a beam, simply supported at the ends, the maximum bending moment under any given wheel load occurs when this wheel load and the centre of gravity of the total wheel system are equidistance from the end of the beam".
- (b) A train of wheel loads crossing a beam of 12 m span from left to right with the 20 kN load leading. Calculate the maximum bending moment at 4.5 m from the left support as well as the position and amount of the absolute maximum bending moment in the beam.
- (c) Discuss Muller – Breslau's Principles and its application in structural analysis.
- (d) What do you understand by influence lines for beams and trusses ? What are the advantages of influence lines ? Discuss with examples.

- (e) Four wheel loads of 10, 12, 15 and 8 tonnes respectively, spaced at 5 m and followed by a uniformly distributed load of 2 tonne per m run extending over a span of 10 m starting a point 5 m behind the 8 tonne load, cross a girder of 75 m span from left to right. Calculate the shear force and bending moment at a section 30 m from the right of support. Use influence Lines.
- (f) The arrangement span in a balance cantilever bridge as shown in the figure. Draw influence line diagram for :
- The reaction at A
  - The bending moment at B
  - The shear force at C



3. Attempt **any two** of the following :
- A three hinged arch of span 100 m and rise 20 m carries five vertical loads of 30 kN each equally spaced horizontally. Determine the horizontal thrust and draw the bending moment diagram if :
    - the arch is parabolic
    - the arch is segmental

- (b) A three hinge circular arch has a span of 100m and rise of 25 m. It is loaded with uniformly distributed load of 10 kN/m covering the central half span only. Find the maximum positive and negative bending moment in the arch, and also calculate the normal thrust and radial shear force at the section of maximum moment.
- (c) Define pressure line, and explain its significance in the analysis of arches. State and prove Eddy's theorem.

4. Attempt **any two** of the following :

- (a) (i) A simply supported beam of uniform cross section subjected to udl. Calculate the deflection at its centre. Use strain energy method.
- (ii) A simply supported beam of uniform cross section subjected to concentrated load at mid span. If span of the beam is 10 m, calculate slope at its end. Use conjugate beam method.
- (b) (i) Determine the slope and deflection at free end of a cantilever beam of span  $L$ , uniformly loaded with load  $w$ . Use unit load method.  $EI = \text{constant}$ .
- (ii) Write statement of Castigliano's first theorem.
- (c) Write statement and prove the Maxwell's theorem.

5. Attempt **any four** of the following :
- (a) Discuss the mohr circle regarding unsymmetrical bending of bars.
  - (b) Determine the principle moment of inertia for an unequal angle section  $200 \text{ mm} \times 150 \text{ mm} \times 10 \text{ mm}$ .
  - (c) Write the assumptions in bending of curved bars with large initial curvatures.
  - (d) A beam is subjected to unsymmetrical bending. Locate the neutral axis of the section.
  - (e) A beam of rectangular section  $80 \text{ mm}$  wide and  $120 \text{ mm}$  deep is subjected to a bending moment of  $12 \text{ kN m}$ . The trace of plane of loading is inclined at  $45^\circ$  to the YY axis of the section. Calculate the maximum bending stress induced in the beam.

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