

B.Tech. (Main & COP)
Fourth Semester Theory Examination 2016-17
Structural Analysis-I

Time: 3 Hours

Total Marks: 100

Note: Attempt all questions Assume missing data suitably.

1. Attempt any two parts of the following: (10x2=20)

(a) Analyze the truss shown in Fig.1, using method of tension coefficient.

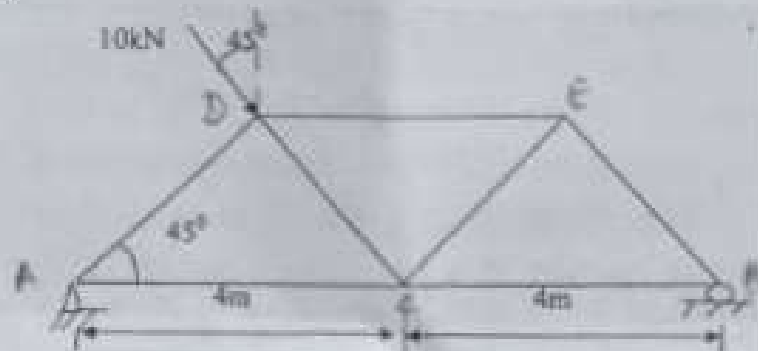


Fig - 1

(b) Determine the member forces in all the members of the truss shown in Fig. 2, using method of joints.

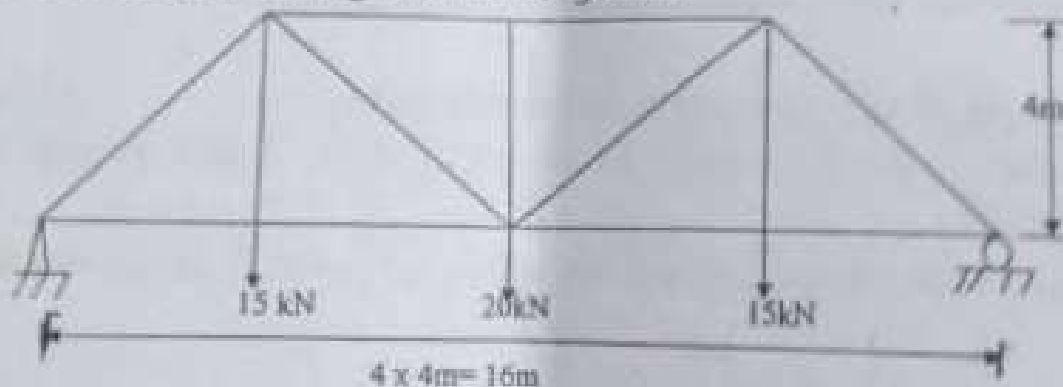


Fig - 2

(c) Explain the following:

- (i) Static and kinematic indeterminacy
- (ii) Degree of freedom
- (iii) Classification of structures

2. Attempt any two parts of the following:

(10x2=20)

(a) A single concentrated load of 60 kN crosses a simply supported beam of 10 m span. Using influence line diagram, determine the

maximum shear force and bending moment at a section 3 m from the left end of the beam.

(b) Write down and prove the statements of propositions of several point loads.

(c) Discuss Muller Breslau's principle along with its application to trusses.

3. Attempt any two parts of the following: (10x2=20)

(a) What do you mean by an Arch? How an arch is better as compared to a beam? Under what conditions and type of loading, the bending moment throughout the arch is zero? Support your answer with proof.

(b) A three hinged parabolic arch has a span of 75 m and a rise of 20 m. It carries a point load of 15 kN at left quarter span. Calculate the reactions and draw bending moment diagram. Also calculate the normal thrust and radial shear at quarter span.

(c) A three hinged parabolic arch has a span of 150 m and a rise of 30 m. Determine the maximum bending moment and maximum horizontal thrust when (i) a concentrated load of 250 kN rolls over it from one end to the other and (ii) a uniformly distributed load of 25 kN/m longer than span crosses it.

4. Attempt any two parts of the following: (10x2=20)

(a) Explain the conjugate beam method in detail giving suitable examples.

(b) Determine the slope and deflection at point B as shown in fig. 3.

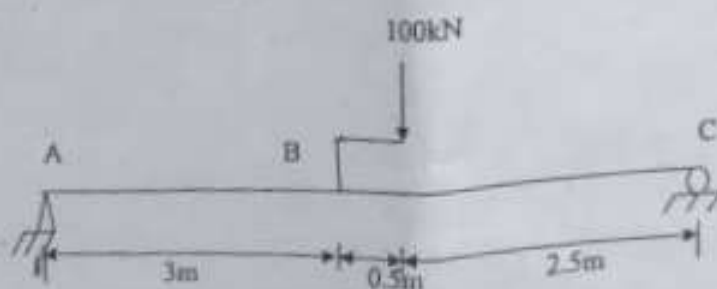


fig. 3

(c) A simply supported beam carries a load which varies uniformly from 15 kN/m at one end to 60 kN/m at the other. Calculate the central deflection if the span is 7 m. Take $I = 25000 \text{ cm}^4$. Use any method of your choice.

5. Attempt any two parts of the following: (10x2=20)
- (a) What do you mean by unsymmetrical bending? Write down the assumptions made in the analysis of beams subjected to unsymmetrical bending. Also, derive the expression for determination of neutral axis for unsymmetrical bending.
- (b) Derive the expression for determination of stress at any point of the cross section of a short column subjected to bi-axial bending.
- (c) An unequal angle ISA 150x115x10 as shown in Fig. 4a & 4b carries vertical load of 10 kN across a span of 4 m. The load is acting at mid span. Determine the extreme fibre stresses.

