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

PAPER ID : 0025 Roll No.

B. Tech.

(SEM. IV) THEORY EXAMINATION 2011-12

STRUCTURAL ANALYSIS—I

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt ***all*** questions.

(2) Assume any data suitably, if missing.

(3) Use of calculator is allowed.

1. Attempt any ***four*** parts of the following : **(5×4=20)**

(a) What do you mean by static indeterminacy ? Explain giving at least two examples with reference to trusses.

(b) What are different methods of analysis of trussor ? Explain any one in detail.

(c) Analyse the space frame shown in Fig. 1, using Tension coefficient method.

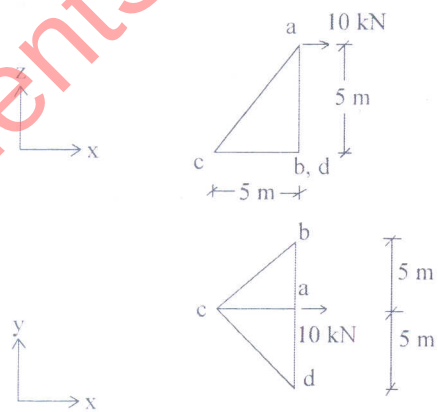

Fig. 1

(d) Analyse the truss shown in Fig. 2.

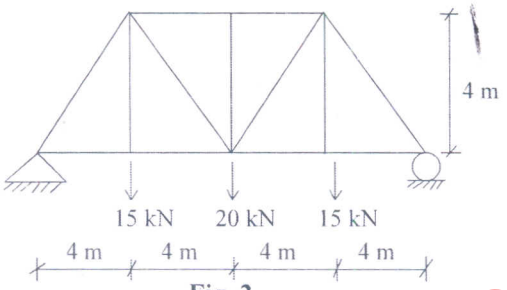

Fig. 2

(e) Explain briefly the classification of structures.

(f) What are various types of trusses ? Explain with the help of neat sketches.

2. Attempt any *two* parts of the following : **(10×2=20)**

(a) A uniformly distributed load of 20 kN/m intensity covering a length of 6 m moves over a simply supported beam of 15 m span. Determine the maximum positive shear force, maximum negative shear force and maximum bending moment at a section located at 5 m from the left support.

(b) Draw influence line diagram for positive shear force, negative shear force and bending moment at a section 2 m from left support of a simply supported beam of 8 m span. Hence, determine the maximum values of positive shear force, negative shear force and bending moment due to two point loads of 75 kN followed by 150 kN moving from left to right. The distance between the loads is 2.5 m.

(c) State and prove the propositions used for several point loads moving over a simply supported beam.

3. Attempt any *two* parts of the following : **(10×2=20)**

(a) A three hinged parabolic arch has a span of 60 m and a rise of 15 m. The arch is subjected to a point load of 20 kN at 150 m from the left support (hinge). Calculate the reactions and draw bending moment diagram. Also calculate the normal thrust and radial shear at left quarter span.

(b) A three hinged circular arch has a span of 125 m and a rise of 25 m. It is subjected to a uniformly distributed load of 30 kN/m covering the central half span. Determine the maximum sagging and logging moments in the arch. Also calculate the thrust, shear and bending moment at quarter span.

(c) What do you understand by linear arch ? Explain briefly. Also write down the statement of Eddy's theorem and prove it.

4. Attempt any *two* parts of the following : **(10×2=20)**

(a) Determine the horizontal and vertical deflection at point F in the frame shown in Fig. 3. using unit load method.

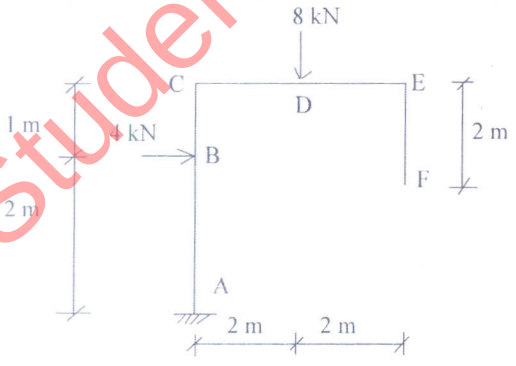

Fig. 3

(b) Determine the slope and deflection at the free end of a cantilever beam of span l subjected to a point load w at the free end, using any method of your choice. Take EI as constant.

(c) State the Betti's law of reciprocal theorem and Maxwell's law of reciprocal theorem. Also prove the Maxwell's law of reciprocal theorem.

5. Attempt any *two* parts of the following : **(10×2=20)**

(a) A cantilever beam of 40 mm × 40 mm section, 2 m span is subjected to a load of 1 kN at the free end. The load is inclined at 30° with the vertical. Determine the position of the neutral axis and the maximum stress in the beam.

(b) What do you mean by shear centre ? Find the position of the shear centre for the channel section shown in Fig. 4.

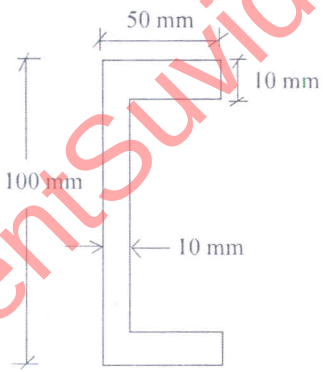

Fig. 4

(c) What do you understand by bending of curved bars ? Write down the assumptions made in the bending of curved bars with large initial curvatures.