8. Draw the influence line diagram for B.M. at a point 15 m distant from the left hand abutment of abridge girder of 25 m span. Find the maximum B.M. at that point due to a series of wheel loads 10, 20, 20, 20 and 20 tonnes at centre 4, 2.5, 2.5 and 2.5 metres. The loads can cross in either direction, the 10 kN wheel load leading in each case.   **10**

(Compulsory Question)

9. (i) State the principle of virtual work for deflection.

   (ii) Describe conjugate beam method in brief.

   (iii) State and prove Maxwell-Betti's theorem.

   (iv) Define an Arch. How an arch differ from a beam.

   (v) Differentiate between determine and unstable structures with example.   **5×4=20**

July-22-00249

B. Tech. EXAMINATION, 2022

Semester IV (CBCS)

STRUCTURAL ANALYSIS–I

CE-401

Time : 3 Hours   *Maximum 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, selecting *one* question from each Section A, B, C and D. Q. No. 9 is compulsory.

Section A

1. (i) Explain the Maxwell law of reciprocal theorems.

   5

   (ii) Explain Static Indeterminacy, Kinematic Indeterminacy and Degree of Indeterminacy. **5**

2. Determine the slope and deflection at the free end of a cantilever beam as shown in Fig. 1 by moment area method (Take EI = 3000 kNm²). **10**
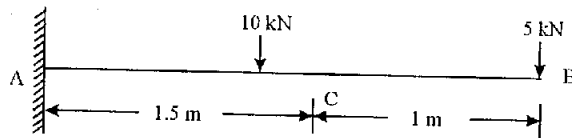

Fig. 1

Section B

3. Determine the reaction at A and the moment at B as shown in Fig. 2 by using strain energy method. **10**
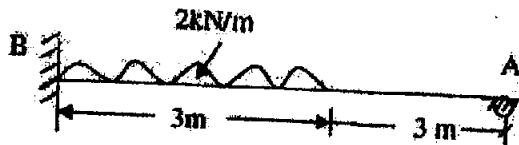

Fig. 2

4. Compute the vertical deflection of joint E by unit load method as shown in Fig. 3. **10**
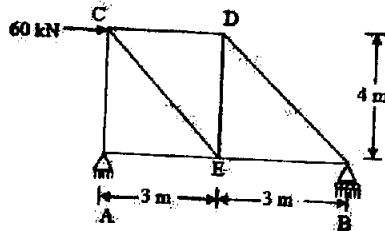

Fig. 3

Section C

5. A three hinged parabolic arch hinged at the supports and at the crown has a span of 26 m and a central rise of 8 m. It carries a concentrated load of 6 kN at 10 m from the left support and a uniformly distributed loads of 35 kN/m over the right half portion. Determine the maximum moment for the arch. **10**

6. A cable is suspended between two points which are at the same level 120 m apart horizontally. The cable carries uniform load of 15 N per horizontal meter and two concentrated loads, one of 900 N at 40 m horizontally from one end the other of 300 N at 40 m horizontally from the other end. Determine the horizontal distance from one end to the lowest point and maximum tension in the cable. **10**

Section D

7. The following system of the wheel loads crosses a span of 25 meters :

Wheel load 15, 17, 21, 24 and 19 kN.

Distance between centre 4, 4, 5 and 5 metres.

Find the maximum value of bending moment and shearing force in the span. **10**