Seat
No.

**[5459]-108**

## S.E. (Civil) (Second Semester) EXAMINATION, 2018
## STRUCTURAL ANALYSIS—I
### (2015 PATTERN)

**Time : Two Hours**　　　　　　　　　　　**Maximum Marks : 50**

**N.B. :—** (i) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**.

　　(ii) Neat sketches must be drawn wherever necessary.

　　(iii) Figures to the right indicate full marks.

　　(iii) Assume suitable data if necessary.

　　(iv) Use of electronic pocket calculator is allowed.

　　(v) Use of cell phone is prohibited during examination.

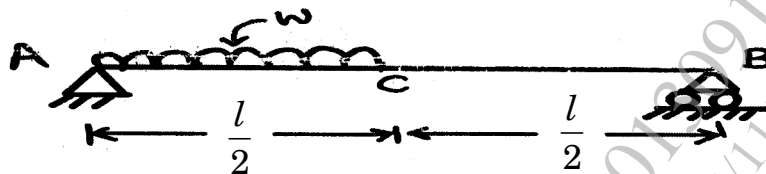1. (a) Using Macaulay's method, determine maximum deflection shown in figure below at 'B'. [6]



Fig. 1

　　(b) A cantilever beam subjected to uniformly distributed load 10 kN/m on entire span of 3 m; determine maximum slope and deflection in term of EI. [6]

**2.** (*a*) Using Castigliano's first theorem, find vertical and horizontal deflection of 'A' as shown in figure below : [6]
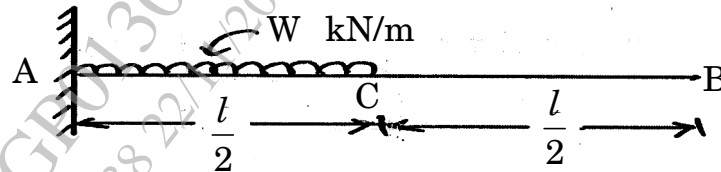


Fig. 2

(*b*) Analyse the continuous beam ABC as shown in figure below using three moment theorem. Also draw SFD and BMD assuming EI = constant. [6]
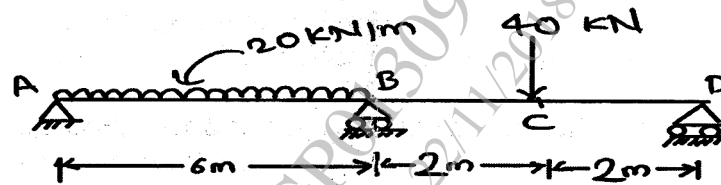


Fig. 3

**3.** (*a*) Determine the horizontal displacement of the joint C of the pin jointed frame as shown in figure below. The cross-section area of AB is 500 mm$^2$ and that of AC and BC is 750 mm$^2$. Assume E = 200 kN/mm$^2$. [6]
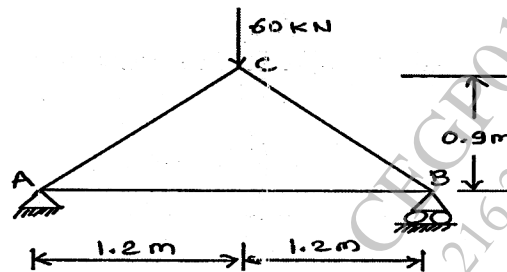


Fig. 4

(*b*) Two loads 200 kN and 80 kN spaced at 0.8 m apart rolls on girder. Find maximum positive and maximum negative bending moment that can occur at section 'C' by placing the rolling load properly show in in figure below. [6]
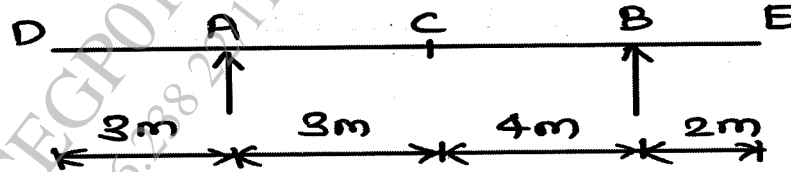


Fig. 5

*Or*

**4.** (*a*) Draw Influence Line Diagram for the members $U_1U_2$, $L_1L_2$ and $U_1L_1$ of a truss as shown in figure below. [6]
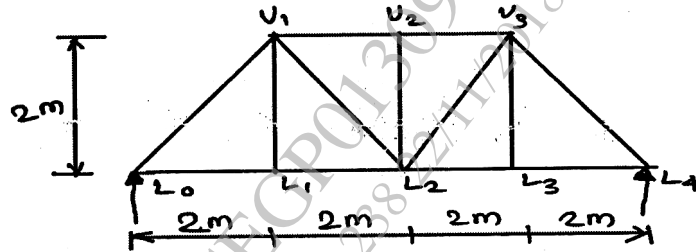


Fig. 6

*Or*

(*b*) Find the vertical deflection of the joint C of truss as shown in figure below. The area of the inclined tie is 2000 mm$^2$ and area of the horizontal member is 1600 mm$^2$. Take E 200 Gpa. [6]
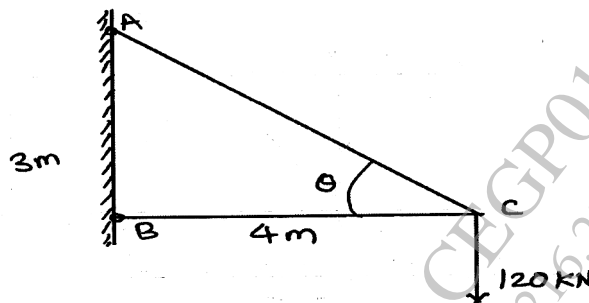


Fig. 7

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**5.** (*a*) A three hinged parabolic arch having supports at different levels as shown in figure below. Determine horizontal thrust developed. Also find bending moment, normal thrust and radial shear force developed at section 15 m from left support. [7]
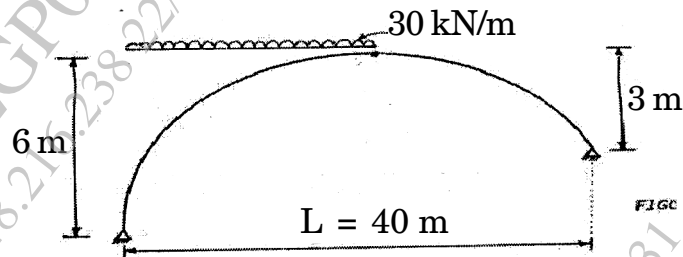


30 kN/m

3 m

6 m

L = 40 m

FIG.

Fig. 8

(*b*) Derive the expression for horizontal thrust when entire span of two hinged parabolic arch is loaded with udl of intensity '*w*' kN/m. [6]

*Or*

**6.** (*a*) A three hinged arch has span of 30 m and rise of 10 m. The arch carries a uniformly distributed load of 60 kN/m on the left half of its span. It also carries two concentrated loads of 160 kN and 100 kN at 5 m and 10 m from the right end. Determine the horizontal thrust at each support. [7]

(*b*) Two hinged parabolic arch of span 30 m and rise 6 m carries two point loads, each of 60 kN, acting at 7.5 m and 15 m from left end respectively.

Determine the horizontal thrust and bending moments below the point loads. [6]

**7.** (*a*) Determine the shape factor for asymmetric I-section. Where, [7]

Top flange = 250 mm × 50 mm

Web thickness = 50 mm

Depth of Web = 200 mm

Bottom flange = 400 mm × 50 mm.

(*b*) State the assumptions in plastic theory. [6]

*Or*

**8.** (*a*) Determine the plastic moment at collapse for the continuous beam ABCD loaded with ultimate load as shown in figure below with constant $M_p$. [7]



**Fig. 9**

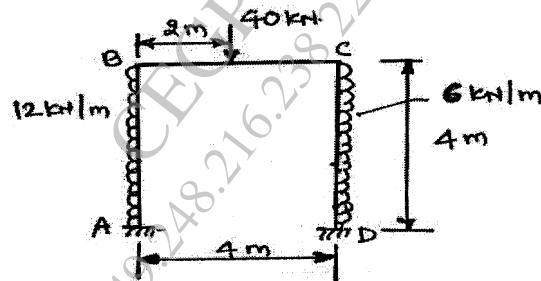(*b*) Explain Idealised and True stress-strain curve for mild steel in tension. [6]