

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

PAPER ID : 2133

Roll No.

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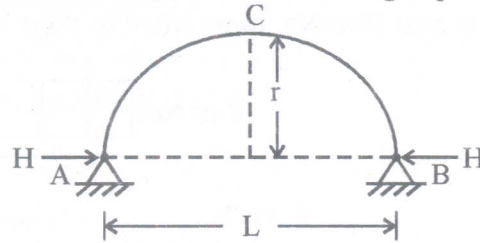
B.Tech.**(SEMESTER-V) THEORY EXAMINATION, 2012-13****STRUCTURAL ANALYSIS – 2****Time : 3 Hours]****[Total Marks : 100****Section – A**1. Attempt **all** question parts :**10 × 2 = 20**

- Name the three classical force methods used in the analysis of continuous beams.
- What are the advantages of slope-deflection method over moment distribution method ?
- What is meant by relative stiffness of a member ?
- Define Stiffness factor.
- State Muller Breslau's principle of influence line theorem.
- How will you obtain degree of static indeterminacy ?
- What is a two hinged arch ? Find out the horizontal thrust.
- Distinguish between flexibility method and stiffness method.
- Define the term yield moment and elastic bending.
- Define safe factor.

Section – B2. Attempt any **three** question parts :**10 × 3 = 30**

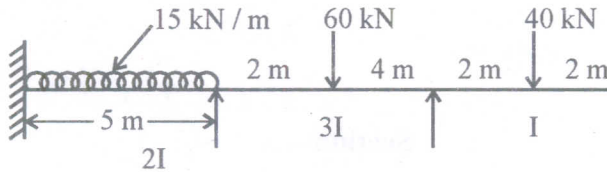
- A two hinged parabolic arch of span 20 m and rise 4m carries a uniformly distributed load of 5 t/m on the left half of span as shown in figure. The moment of inertia I of the arch section at any section at any point is given by $I = 10 \sec \theta$ where θ = inclination of the tangent at the point with the horizontal and I_0 is the moment of inertia at the crown. Find
 - the reactions at the supports
 - the position and value of the maximum bending moment in the arch.

- (b) Draw the schematic influence time diagrams for maximum bending moment, shear force and horizontal thrust for a two-hinged parabolic arch shown in fig. 1.



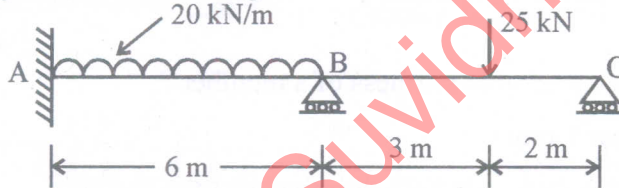
(fig. 1)

- (c) Analyse the continuous beam given in figure 2. by slope deflection method and draw the B.M.D



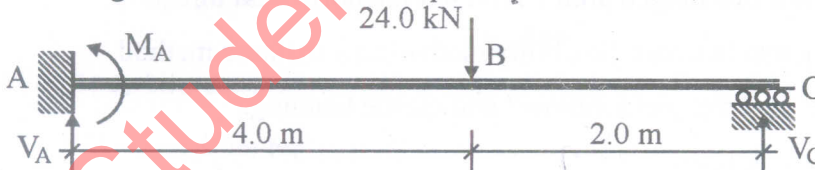
(fig. 2)

- (d) Analyse the continuous beam shown in Fig.3, using flexibility method if the download settlement of supports B and C in mm units are 2700/EI and 1200/EI respectively. Draw the bending moment and shear force diagrams. EI is constant.



(fig. 3)

- (e) A propped cantilever is 6.0 m long and supports a collapse load of 24 kN as shown in Figure.4. Determine the required plastic moment of resistance M_p .



(fig. 4)

Section - C

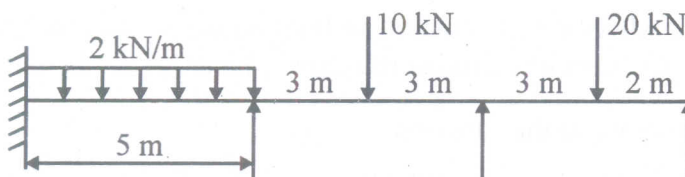
Attempt **all** questions

10 × 5 = 50

3. Attempt any **two** parts :

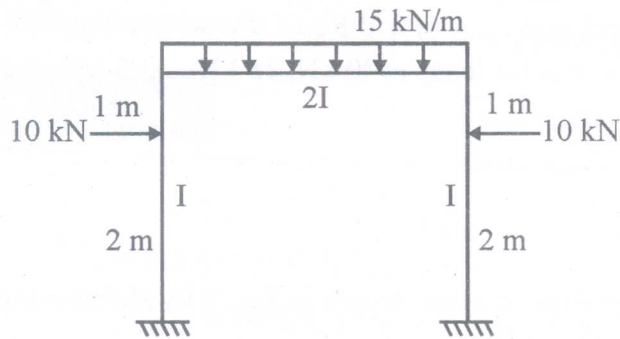
(5 × 2 = 10)

- (a) Draw the bending moment diagram and shear force diagram for the continuous beam shown in figure 5, below using moment distribution method. EI is constant.



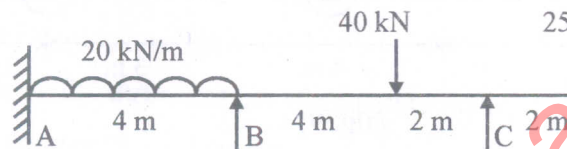
(fig. 5)

- (b) Analyse the frame shown in (fig.6) below by the slope deflection method and draw the bending moment diagram.



(fig. 6)

- (c) Using slope deflection method, determine slope at B and C for the beam shown in figure 7. below. EI is constant. Draw free body diagram of BC.



(fig. 7)

4. Attempt any **one** part :

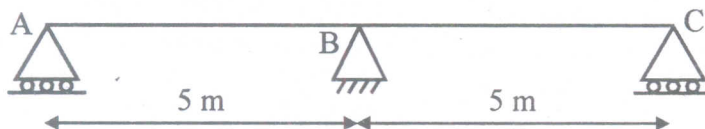
$10 \times 1 = 10$

- (a) The cables of a suspension bridge have a span of 40 m and a dip of 5 m. Each cable is stiffened by a girder hinged at the ends and at mid span to enable to cable to maintain its parabolic shape. A UDL of 10 kN/m over the whole span and a live load of 30 kN/m over 10 m length in central part. Determine the maximum cable tension when the head of the live load is on the central hinge. Calculate maximum S.F. and B.M. at a section 10m from the left end.
- (b) Draw the schematic influence line diagrams for maximum moment, and shear force for a two-hinged stiffening girder.

5. Attempt any **one** part :

$10 \times 1 = 10$

- (a) Determine the influence line for R_A for the continuous beam shown in the fig. 8. Compute influence line ordinates at 1 m intervals.



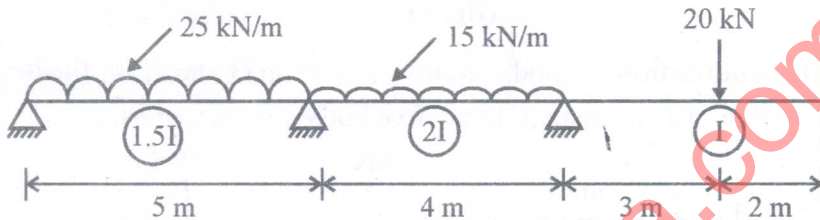
(fig. 8)

- (b) Derive the influence diagram for reactions and bending moment at any section of a simply supported beam. Using the ILD, determine the support reactions and find bending moment at 2 m, 4 m and 6 m for a simply supported beam of span 8 m subjected to three point loads of 10 kN, 15 kN and 5 kN placed at 1m, 4.5 m and 6.5 m respectively.

6. Attempt any **one** part :

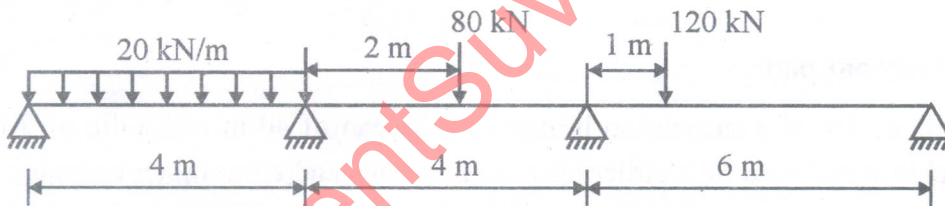
10 × 1 = 10

- (a) Analyze the continuous beam shown in Fig. 9 by stiffness method. Draw bending moment diagram and elastic curve.



(fig. 9)

- (b) Analyse the Continuous beam shown in Fig. 10 using flexibility method and draw BMD.



(fig. 10)

7. Attempt any **two** parts :

5 × 2 = 10

- (a) A beam of span 6m is to be designed for an ultimate u.d.l of 25 kN/m. The beam is simply supported at the ends. Design a suitable I section using plastic theory, assuming $\sigma_y = 250 \text{ N/mm}^2$.
- (b) Derive the safe factor for Rectangle, Diamond and Circular sections.
- (c) Explain the methods of plastic analysis.