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Question Paper Code : 90333

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Sixth Semester

Civil Engineering

CE 8602 — STRUCTURAL ANALYSIS – II

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the use of influence line diagram.
2. Sketch the influence line diagram for shear force at any section of a simply supported beam.
3. State Muller Breslau's principle.
4. Differentiate determinate and indeterminate structures.
5. Distinguish between two hinged and three hinged arches.
6. State Eddy's theorem of an arch.
7. List any two need for cable structures.
8. State the main functions of stiffening girders in suspension bridges.
9. List out the assumptions made for plastic analysis.
10. State upper bound and lower bound theorem.

PART B — (5 × 13 = 65 marks)

11. (a) A simply supported beam has a span of 15 m and subjected to an UDL of 30 kN/m, 5 m long travelling from left to right. Draw the ILD for shear force and bending moment at a section 6 m from the left end. Use these diagrams for calculating the maximum BM and SF at this section. (13)

Or

(b) Draw the ILD for the forces in members U_2L_2 and U_2L_3 of the truss shown in figure 1. (13)

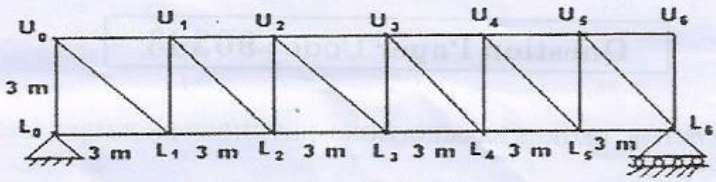

Fig. 1

12. (a) Draw the influence line for M_B of the continuous beam ABC simply supported at A and C using Muller Breslau's principle. AB 3 m, BC = 4 m. EI is constant. (13)

Or

(b) Sketch the ILD for the propped cantilever reaction of a propped cantilever beam having span 6 m. EI is constant. (13)

13. (a) A parabolic 3-hinged arch carrier a UDL of 30 kN/m on the left half of the span. It has a span of 16 m and central rise of 3 m. Determine the resultant reaction at supports. Find the bending moment, normal thrust and radial shear at 2 m from left support. (13)

Or

(b) A circular arch to span 20 m with a central rise 5 m is hinged at the crown and springing. It carries a point load of 100 kN at 6 m from the left support. Calculate

(i) The reactions at the supports, (4)

(ii) The reactions at crown, (4)

(iii) Moment at 5 m from the left support. (5)

14. (a) A suspension cable has a span of 120 m and a central dip of 10 m and is suspended from the same level at both towers. The bridge is stiffened by a stiffening girder hinged at the end supports. The girder carries a single concentrated load of 100 kN at a point 30 m from left end. Assuming equal tension in the suspension hangers. Calculate the horizontal tension in the cable and the maximum positive bending moment. (13)

Or

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(b) A suspension bridge has a span 50 m with a 15 m wide runway. It is subjected to a load of 30 kN/m including self weight. The bridge is supported by a pair of cables having a central dip of 4 m. Find the cross sectional area of the cable necessary if the maximum permissible stress in the cable materials is not to exceed 600 MPa. (13)

15. (a) Determine the shape factor of a T-section beam of flange dimension 100 × 12 mm and web dimension 138 × 12 mm thick. (13)

Or

(b) A rectangular portal frame of span L and height L/2 is fixed to the ground at both ends and has a uniform section throughout with its fully plastic moment of resistance equal to Mp. It is loaded with a point load W at centre of span as well as a horizontal force W/2 at its top right corner. Calculate the value of W at collapse of the frame. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A beam ABC is supported at A, B and C as shown in Fig 2. It has the hinge at D. Draw the influence lines for

(i) Reactions at A, B and C (5)

(ii) Shear to the right of B (5)

(iii) Bending moment at E. (5)

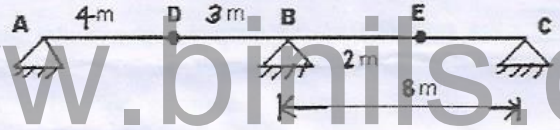

Fig. 2

Or

(b) Determine the collapse load 'W' for a three span continuous beam of constant plastic moment 'Mp' loaded as shown in figure 3. (15)

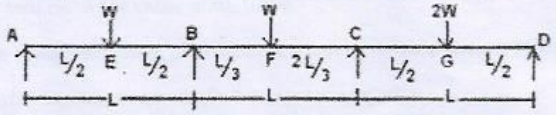

Fig. 3