Reg. No. : | | | | | | | | | | | | |

**Question Paper Code : 40311**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Sixth Semester

Civil Engineering

CE 8602 – STRUCTURAL ANALYSIS – II

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

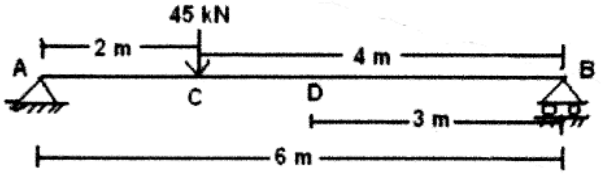
PART A — (10 × 2 = 20 marks)

1. State and explain the principle of virtual work.
2. Distinguish between pin jointed and rigidly jointed structures.
3. What are the types of connections possible in the model of begg's deformeter?
4. What is meant by absolute maximum bending moment in a beam?
5. State the Eddy's theorem.
6. Under what conditions will the bending moment in an arch be zero throughout?
7. What are the main functions of stiffening girders in suspension bridges?
8. What is the true shape of cable structures?
9. What is difference between plastic hinge and mechanical hinge?
10. List out the shape factors for the following sections.



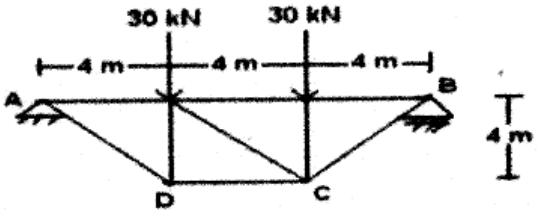
PART B — (5 × 13 = 65 marks)

11. (a) Determine the deflection under the load point of the beam shown in figure below. Take E = 200 × 106 kN/m$^2$ and I = 14 × 10$^{-6}$ m$^4$. Use the principle of virtual work. (13)




Or

(b) The steel truss shown in figure is anchored at A and supported on rollers at B. if the truss is so designed that, under the given loading, all tension members are stressed to 110 N per square mm and all compression members to 85 N/mm$^2$. Find the vertical deflection of the point C, Take E = 2 × 10$^5$ N/mm$^2$. (13)




12. (a) A single rolling load of 100 kN moves on a girder of span 20 m. (i) Construct the influence lines for (1) shear force and (2) bending moment for a section 5 m from the left support. (ii) Construct the influence lines for points at which the maximum shears and maximum bending moment develop. Determine these values. (13)

Or

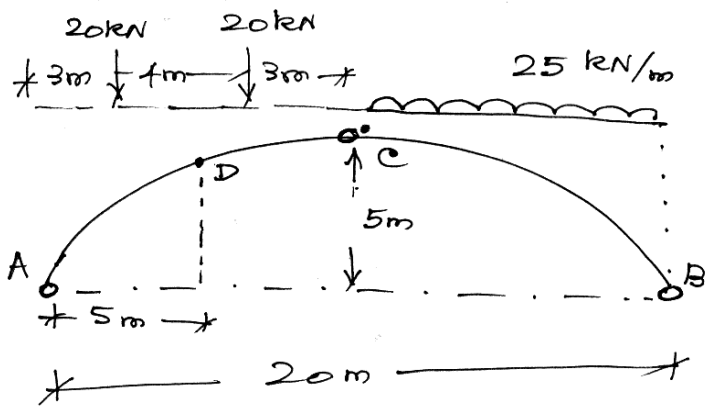
(b) A train of 5 wheel loads crosses a simply supported beam of span 22.5 m. Using influence lines, calculate the maximum positive and negative shear forces at mid span and absolute maximum bending moment anywhere in the span. (13)



13. (a) Distinguish between two hinged and three hinged arches. (13)

Or

(b) A parabolic 3-hinged arch carries loads as shown in Fig 13 (b). Determine the resultant reactions at supports. Find the bending moment, normal thrust and radial shear at D, 5 m from A. What is the maximum bending moment? (13)



14. (a) 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)

Or

(b) 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)

15. (a) A simply supported beam of span 5 m is to be designed for an udl of 25 kN/m. Design a suitable I section using plastic theory, assuming yield stress in steel as $f_y$ = 250 N/mm$^2$. (13)

Or

(b) A uniform beam of span 4 m and fully plastic moment MP is simply supported at one end and rigidly clamped at other end. A concentrated load of 15 kN may be applied anywhere within the span. Find the smallest value of MP such that collapse would first occur when the load is in its most unfavorable position. (13)

PART C — (1 × 15 = 15 marks)



16. (a) A quarter circular beam of radius 'R' curved in plan is fixed at A and free at B as shown in Figure 16(a). It carries a vertical load Pat its free end. Determine the deflection at free end and draw the bending moment and torsional moment diagrams. Assume flexural rigidity (EI) = torsional rigidity (GJ). (15)

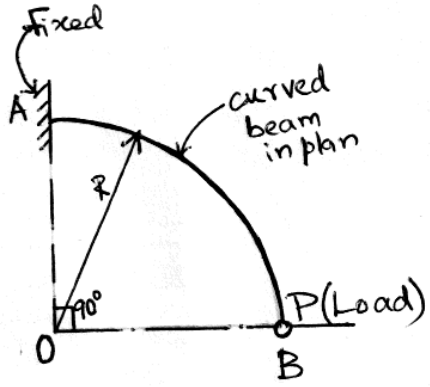



Fig. 16(a)

Or

(b) Derive the shape factor for I section and circular section. (15)

———————