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

**Question Paper Code : 60254**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Civil Engineering

CE 2302/CE 51/10111 CE 502 — STRUCTURAL ANALYSIS — I

(Regulations 2008/2010)

(Common to PTCE 2302/10111 CE 502 — Structural Analysis — I for B.E. (Part-Time) Third Semester – Civil Engineering – Regulations 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the principle of virtual work.

2. What are the difference between determinate and indeterminate structures?

3. What are influence lines?

4. Briefly explain Muller Breaslau's principle.

5. What is the degree of static indeterminacy of a two hinged parabolic arch?

6. State : Eddy's Theorem.

7. State the generalised slope deflection equation.

8. State any four reasons for the sway of portal frames.

9. What is meant by carry over moment?

10. Define relative stiffness and distribution factor.

PART B — (5 × 16 = 80 marks)

11. (a) Determine the vertical displacement of joint A of the truss given in Fig. Q. 11(a). The member BD is subjected to an increase in temperature of 80°C. Take the coefficient of thermal expansion as 0.00012/°C and $E = 2 \times 10^5$ N/mm². The cross sectional area of each member is 1700 mm².

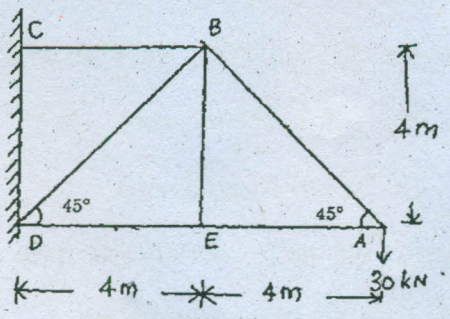


Fig. Q. 11(a)

Or

(b) Using principle of virtual work, determine the horizontal displacement of support D of the frame shown in Fig.Q. 11(b). $E = 200 \times 10^6$ kN/m² and $I = 400 \times 10^{-6}$ m⁴.

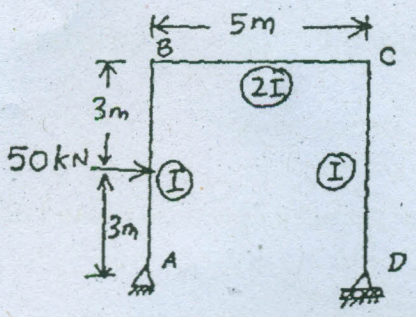


Fig. Q. 11(b)

12. (a) Two wheel loads of 40 kN and 20 kN spaced 4 m apart cross a girder of 10 meters span, with the 20 kN load leading, from left to right. Draw the maximum shear force and bending moment diagrams.

Or

(b) Determine the influence line for the shear force at D, the middle point of span BC, of a continuous beam shown in Fig. 12(b). Compute the ordinates at 1 m interval.

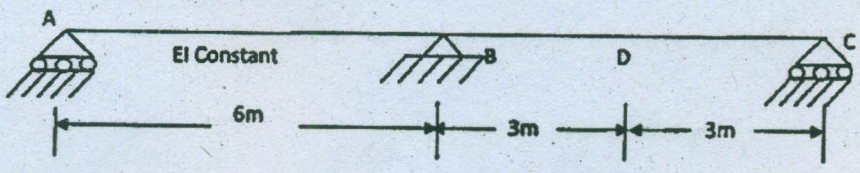


Fig. 12(b)

13. (a) A parabolic three hinged arch carries a UDL of 15 kN/m over the left half of the span. The span of the arch is 18 m and the control rise 2.8 m. Determine the resultant reaction at the supports. Find also the bending moment, normal thrust and radia shear at a section 4.5 m from the left support. (16)

Or

(b) A parabolic two hinged arch has a span of 30 m and a rise of 3 m. A concentrated load of 12 kN acts at 7.5 m from the let end support. The second moment of area varies as the secant of the inclination of the arch axis. Calculate the horizontal thrust and reactions at the hinge. Also calculate the maximum bending moment at the section and draw the bending moment diagram. (16)

14. (a) A symmetric portal frame ABCD is hinged at A and D, and is loaded with a uniformly distributed load of w kN/m over the span BC. Span AB = CD = L meters and BC = 2L meters. Treating joints B and C as rigid, calculate the moments at A, B, C and D using slope deflection method. Draw the bending moment Diagram. EI is constant.

Or

(b) A beam ABC 15 meters long, is simply supported at ends A and B is continuous over joint B and is loaded with a point load of 9 kN at 3 meters from A and a point load of 10 kN at the mid span of BC. Span AB = BC = 8 meters. Using slope deflection method, compute the end moments and plot the bending moment diagram. The beam has constant EI for both the spans.

15. (a) Analyse the continuous beam shown in Fig. Q. 15(a) using moment distribution method and draw the bending moment diagram and shear force diagram. EI is constant.

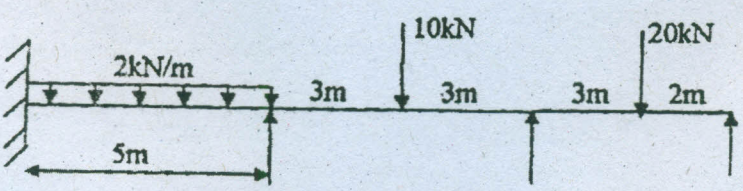


Fig. Q. 15(a)

Or

(b) Analyse the rigid frame shown in Fig. Q. 15(b) by moment distribution method. Moment of inertia of different members are shown in the diagram.

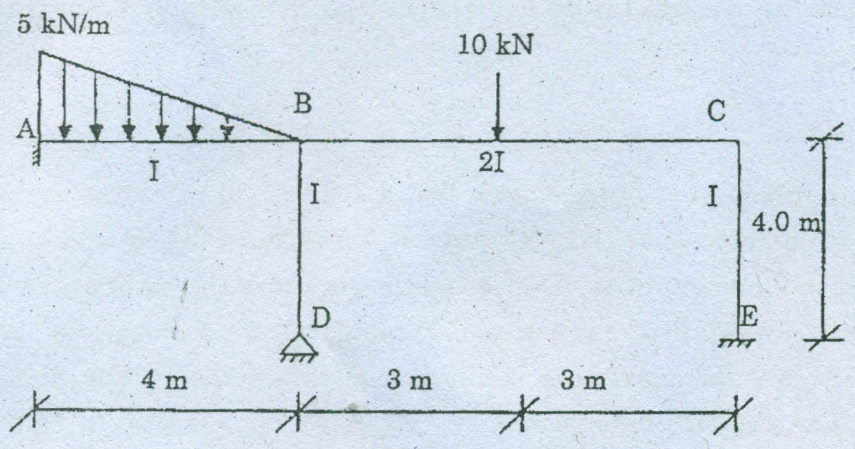


Fig. Q. 15(b)