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B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Sixth Semester

Civil Engineering

CE 2351/CE 61/CE 1352/10111 CE 602/080100036 — STRUCTURAL ANALYSIS — II

(Regulation 2008/2010)

(Common to PTCE 2351 — Structural Analysis – II for B.E. (Part-Time) Fourth Semester – Civil Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate pin-jointed plane frame and rigid jointed plane frame.

2. Mention any two methods of determining the joint deflection of a perfect frame.

3. Write a note on element stiffness matrix.

4. List out the properties of rotation matrix.

5. What is meant by discretisation of structures?

6. What are triangular elements?

7. State upper bound theorem.

8. Brief about plastic hinge.

9. What are the methods available for the analysis of space trusses?

10. What is the need for cable structures?

PART B — (5 × 16 = 80 marks)

11. (a) A cantilever of length 15 meters is subjected to a single concentrated load of 50 kN at the middle of the span. Find the deflection at the free end using flexibility matrix method. EI is uniform throughout.

Or

(b) A two span continuous beam ABC is fixed at A and hinged at supports B and C. Span of AB = span of BC = 9m. Set up flexibility influence co-efficient matrix assuming vertical reaction at B and C as redundant.

12. (a) A two span continuous beam ABC is fixed at A and simply supported over the supports B and C. AB = 10 m and BC = 8 m. Moment of inertia is constant through out. A single concentrated central load of 10 Tons acts on AB and a uniformly distributed load of 8Ton/m acts over BC. Analyse the beam by stiffness matrix method.

Or

(b) A portal frame ABCD with supports A and D are fixed at same level carries a uniformly distributed load of 8 tons /meter on the span AB. Span AB = span BC = span CD = 9 meters. EI is constant throughout. Analyse the frame by stiffness matrix method.

13. (a) Explain the types and applications of beam elements in finite element method.

Or

(b) Explain the methods of solving plane stress and plane strain problems using finite element method.

14. (a) 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 M_y. 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.

Or

(b) A uniform beam of span 4m and fully plastic moment M_p 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 M_p such that collapse would first occur when the load is in its most unfavourable position.

15. (a) Derive the expression for bending moment and torsion for a semi circular beam of radius R. The cross section of the material is circular with radius r. It is loaded with a load at the mid point of the semicircle.

Or

(b) A suspension bridge cable of span 80 m and central dip 8 m is suspended from the same level at two towers. The bridge cable is stiffened by a three hinged stiffening girder which carries a single concentrated load of 20 kN at a point of 30m from one end. Sketch the SFD for the girder.
