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

R 3162

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Fourth Semester

(Regulation 2004)

Civil Engineering

CE 1252 — STRENGTH OF MATERIALS

(Common to B.E. (Part-Time) Third Semester – Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How will you find deflection at a point in a beam using Castigliano's Theorem?

2. State Maxwell's Reciprocal Theorem.

3. What is the degree of indeterminacy of fixed and propped cantilever beams subjected to vertical loads?

4. How will you find prop reaction?

5. What is core of the section?

6. Write the Euler's crippling load for the column with (a) Both ends hinged and (b) Both ends fixed.

7. Mention different theories of failure.

8. Define volumetric strain.

9. What are the reasons for unsymmetrical bending occurring in the beams?

10. What are the assumptions made in Winkler-Bach formula?

PART B — ($5 \times 16 = 80$ marks)

11. (a) A simply supported beam of span 8 m carries two concentrated loads of 32 kN and 48 kN at 3m and 6m from left support. Calculate the deflection at the centre by strain energy principle.

Or

(b) Find the deflection at D in the frame shown in Fig. 1. Areas of members are given in brackets in square cm. Assume E = 200 kN/mm^2.

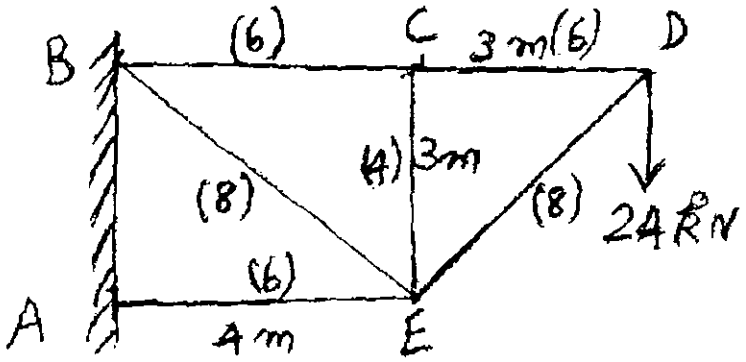

Fig. Q. 11 (b)

12. (a) A Propped cantilever of span of 6m having the prop at the end is subjected two concentrated loads of 24 kN and 48 kN at one third points respectively from left fixed end support. Draw shear force and bending moment diagrams with salient points.

Or

(b) A continuous beam ABC has fixed end at A and is simply supported at B and C. AB = 4m BC = 5m. Span AB carries a load of 20 kN at 3m from A. Span BC carries two concentrated loads of 10 kN and 20 kN at 2 m and 3 m from right support C. Draw shear force and bending moment diagrams.

13. (a) (i) Derive the formula to find the crippling load in a column of length 'l' fixed at one end and other end is free. (8)

(ii) Find the Rankine's critical load for a column of 150 mm internal diameter, 15 mm thick and of length 5.2 m hinged at both ends. E = 200 kN/mm^2. Assume f_c = 500 MN/m^2 and α = 1/1600. (8)

Or

(b) A thick walled steel cylindrical shell of internal diameter 200 mm and external diameter 800 mm is subjected to fluid pressure of 150 MPa. Calculate the principal stresses and maximum shear stress at a point on the inside surface of the cylinder and calculate increase in inside diameter due to fluid pressure. E = 200 kN/mm^2 and 1/m = 0.25.

14. (a) A steel flat of 250 mm long and 30 mm × 50 mm uniform section is acted upon by a tensile force of 25 kN along its length. A compressive force of 300 kN along its width, a compressive force of 200 kN along its thickness. Assuming Poisson's ratio of 0.25 and modulus of elasticity of 2×10^5 N/mm^2, find change in dimensions and change in volume.

Or

(b) At a point in a material under stress, the intensity of the resultant stress on a certain plane is 60 MN/m^2 inclined at 45° to the normal of that plane. The stress on a plane at right angles to this has normal tensile component of intensity of 30 MN/m^2. Find (i) The resultant stress on the second plane (ii) Direction of principal planes and principal stresses. (iii) The maximum shear stress.

15. (a) Find the principal moment of inertia of channel section shown in Figure (2).

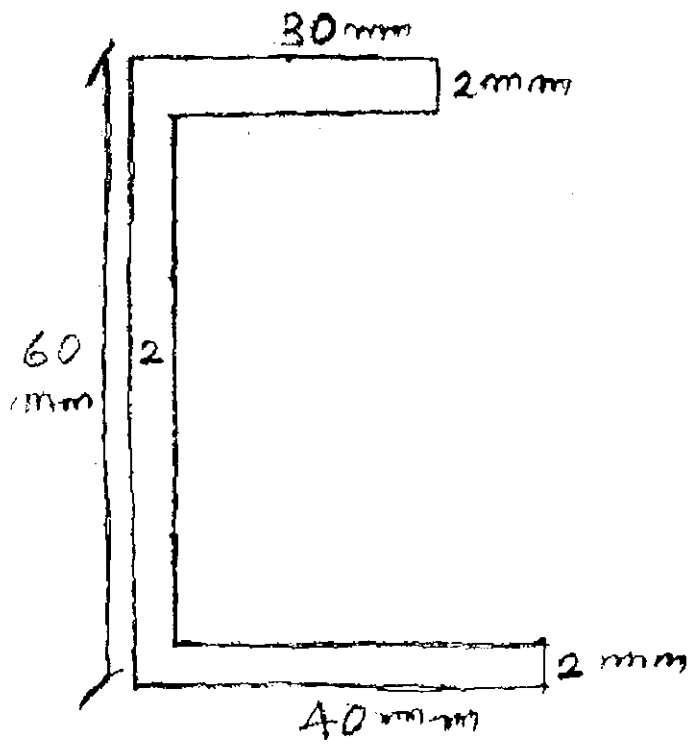

Fig. 15 (a)

Or

(b) A beam of Tee section having flange of 100 mm × 20 mm and web of 150 mm × 10 mm and 3 m long is simply supported at its ends. It carries 4 kN at 30° to vertical and passing through the centroid of the section. Calculate the maximum tensile stresses and maximum compressive stresses. E = 200 kN/mm^2.
