B 206

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

Fourth Semester

Civil Engineering

CE 236 — STRENGTH OF MATERIALS

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What is strain energy stored by a member subjected to a tensile force?

2. Write the principle of virtual work equation for deflection due to bending.

3. What is Williot diagram?

4. Write down the three moment equations for a propped cantilever beam carrying a point load at midspan.

5. What are the methods of analysis of continuous beams?

6. Write down Rankine–Gordon formula for eccentrically loaded columns.

7. What is deviatric stress tensor?

8. What is unsymmetrical bending?

9. Write down Winkler–Bach formula.

10. What is compound cylinder?

PART B — (5 × 16 = 80 marks)

11. (i) Derive the expression for strain energy due to bending. (8)

(ii) Derive the expression for strain energy due to torsion. (8)

12. (a) Analyse the beam shown in Fig. Q. 12 (a).

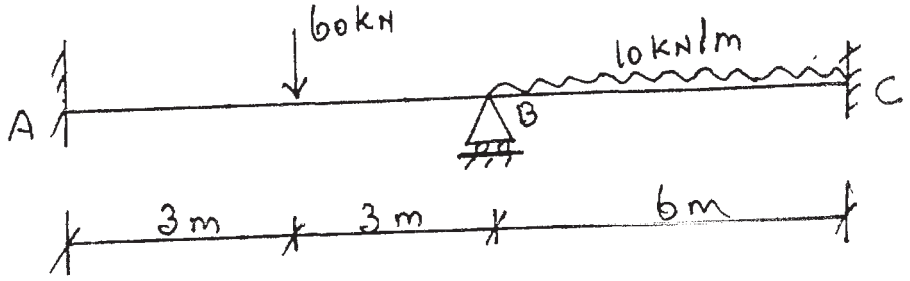

Fig. Q 12 (a)

Or

(b) Analyse beam shown in Fig. Q 12 (b). EI = constant. Draw the bending moment diagram.

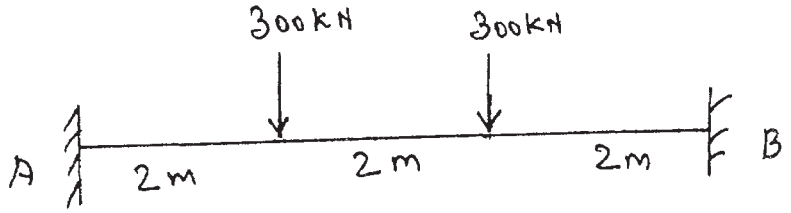

Fig. Q 12 (b)

13. (a) Derive the expression for buckling load of a long column fixed at one end and hinged at the other end.

Or

(b) Find the greatest length of mild steel bar 25 mm × 25 mm in cross–section which can be used as compression member with one end fixed and the other end free to carry a working load of 35 kN. Allow a factor of safety of 4. Take $\alpha = \frac{1}{7500}$ and $f_c = 320\,\text{N/mm}^2$.

14. (a) The state of stress at a point is given by $\begin{bmatrix} 4 & 2 & 3 \\ 2 & 6 & 1 \\ 3 & 1 & 5 \end{bmatrix}$ MPa. Determine the principal stresses.

Or

(b) Explain any two theories of failure.

15. (a) Find the product moment of inertia of a quadrant of a circle about the perpendicular axes OX and OY as shown in Fig. Q 15 (a).

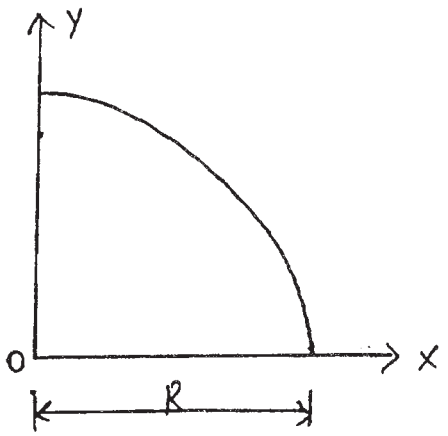

Fig. Q 15 (a)

Or

(b) Find the thickness of metal necessary for a steel cylinder of internal diameter 200 mm to withstand an internal pressure of 50 N/mm^2. The maximum hoop stress in the section is not to exceed 150 N/mm^2. Assume thick cylinder.

———————