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

Question Paper Code : 52759

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third/Fourth Semester

Civil Engineering

CE 6402 – STRENGTH OF MATERIALS

(Common to Petrochemical Engineering/Plastic Technology/
Polymer Technology)

(Regulation 2013)

(Also Common to : PTCE 6402 – Strength of Materials for B.E. (Part-Time)
Second Semester – Civil Engineering (Regulations 2014)

Time : Three hours Maximum : 100 marks

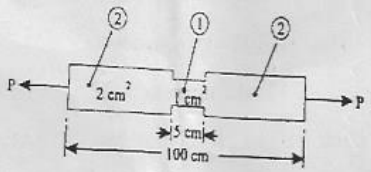
Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Resilience, Proof Resilience and Modulus of Resilience.
2. State the various methods for computing the joint deflection of a perfect frame.
3. What are indeterminate beams? Give two examples.
4. Write the expression of theorem of three moment equation.
5. Give the parameters influencing buckling load of a long column.
6. What are the advantages of compound cylinders?
7. What are called principal stresses?
8. State Van Mises theory.
9. Define shear center.
10. Distinguish between curved beam and a straight beam.

PART B — (5 × 13 = 65 marks)

11. (a) A bar of 100 cm in length is subjected to an axial pull, such that the maximum stress is equal to 150 MN/m². Its area of cross section is 2 cm² over a length of 95 cm and for the middle 5 cm length it is only 1 cm². If E = 200 GN/m², calculate the strain energy stored in bar.



Or

(b) Using Castigliano's theorem, obtain the deflection under a single Concentrated load of 60 kN applied at a distance of 1 m from right end of simply supported beam whose length equal to 4 m. Take EI = 2.2 MNm². (13)

12. (a) A fixed beam AR of length 6 m carries point loads of 150 kN and 120 kN at a distance of 2 m and 4 m from the left end A. Find the fixed end moments and the reactions at the supports. Draw bending moment and shear force diagrams.

Or

(b) A Continuous beam ABC covers two consecutive span AB and BC of lengths of 4 m and 6 m, carrying Uniformly distributed loads of 6 kN/m and 8 kN/m respectively If the ends A and C are simply supported find the support moments at A, B and C. Draw also bending moment and shear force diagrams.

13. (a) Derive an expression for crippling load when one end of the column is fixed and the other end is force.

Or

(b) Determine the maximum and minimum hoop stress across the section of a pipe of 400 mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8 N/mm². Also sketch the radial pressure distribution and hoop stress distribution across the sections.

14. (a) For the state of stress shown in Fig. 14 (a) Find the principal plane, principle stress and maximum shear stress.

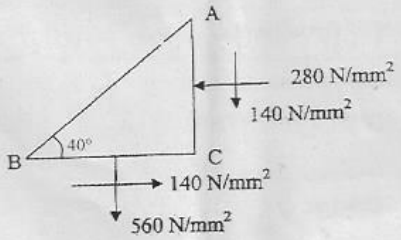


Fig. 14 (a)

Or

(b) In a steel member, at a point the major principal stress is 200 MN/m² and the minor principal stress is compressive. If the tensile yield point of the steel is 235 MN/m², find the value of the minor principal stress at which yielding will commence, according to each of the following criteria of failure

(i) Maximum shearing stress.

(ii) Maximum total strain energy and

(iii) Maximum shear strain energy.

Take Poisson Ratio = 0.26. Take E = 200 GN/m² and 1/m = 0.3.

15. (a) A curved bar is formed of a tube of 120 mm outside diameter and 7.5 mm thickness. The center line of this beam is a circular arc of radius 225 mm. A bending moment of 3 kNm tending to increase curvature of the bar is applied. Calculate the maximum tensile and compressive stresses setup, in the bar.

Or

(b) A curved bar of rectangular section 60 mm wide by 75 mm deep in the plane of bending initially unstressed is subjected to bending moment of 2.25 kNm which tends to straighten the bar. The mean radius of curvature is 150 mm. Find

(i) The position of the neutral axis

(ii) The greatest bending stresses.

Draw a diagram to show approximately how the stress varies across the section.

PART C — (1 × 15 = 15 marks)

16. (a) Explain the following :

(i) Principle of virtual work. (5)

(ii) Castigliano's theorems. (5)

(iii) Strain energy due to torsion. (5)

Or

(b) Explain the following:

(i) The failure of short columns under compression. (7)

(ii) Distortion energy theories. (8)