Reg. No. :

Question Paper Code : 40782

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Third/Fourth Semester
Civil Engineering
CE 6402 – STRENGTH OF MATERIALS
(Common to Petrochemical Engineering, Plastic Technology, Polymer Technology)
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A (10×2=20 Marks)

1. Define Strain Energy.
2. State Castigliano's Second Theorem.
3. Find the reaction at prop in a propped cantilever of span 2m carrying a UDL of 6 kN/m^2 over the entire span.
4. State the theorem of three moments.
5. Define core of a section.
6. What are compound cylinders ?
7. What is principal plane and principal stress ?
8. Explain Tresca's theory.
9. What are the assumptions made in Winkler-Bach formula ?
10. What is Unsymmetrical bending ?

PART – B (5×13=65 Marks)

11. a) A beam 4 cm wide, 8 cm deep is freely supported over a span of 2 m. A weight of 2 kg is dropped on to the middle of the beam from a height of 4 cm. Calculate the maximum instantaneous stress and deflection. $E = 2 \times 10^6$ kg/cm^2.

(OR)

b) A beam simply supported over a span of 3.5 m carries a UDL of 25 kN/m over the entire span. Taking EI = 2.5 MNm^2 and using Castigliano's theorem, determine the deflection at the center of the beam.

12. a) A continuous beam ABCD is simply supported at A, B, C and D, AB = BC = CD = 5 m. Span AB carries a load of 30 kN at 2.5 m from A. Span BC carries an UDL of 20 kN/m. Span CD carries a load of 40 kN at 2 m from C. Draw the shear force and bending moment diagrams.

(OR)

b) A fixed beam of 5m length is loaded with equal point loads of 130 kN each at distance 1.5 m from each support. Draw the bending moment and shear, a force diagram where $E = 2 \times 10^8$ kN/m^2, $I = 1 \times 10^8$ mm^4.

13. a) Derive an expression for Euler's crippling load when one end of column is fixed and other end is hinged.

(OR)

b) A thick cylinder of internal diameter 10 cm, external diameter 20 cm, is subjected to an internal pressure of 100 kg/cm^2. Draw diagrams showing the distribution of radial pressure and hoop stress in the wall of the cylinder.

14. a) In a material the principal stresses are 60 MN/m^2, 48 MN/m^2 and 26 MN/m^2, Calculate ; total strain energy. Volumetric strain energy, shear strain energy and factor of safety on the total strain energy criterion if the material yields at 120 MN/m^2.

(OR)

b) Explain the following :

i) Maximum Shear stress theory

ii) Maximum strain energy theory

15. a) Find shear center of a channel section 300 mm × 150 mm with thickness of 20 mm from first principles.

(OR)

b) A curved bar is formed of a tube of 120 mm outside diameter and 7.5mm thickness. The centre line of this curved bar 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 set up in the bar.

PART – C (1×15=15 Marks)

16. a) A cantilever of length L and uniform section carries a point load W at the free end. Find the strain energy stored in the beam and calculate the deflection at the free end.

(OR)

b) Determine the principal moments of inertia for an unequal section 60 mm × 40 mm × 6 mm.
