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

Question Paper Code : 40772

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Third Semester
Civil Engineering
CE 6302 – MECHANICS OF SOLIDS
(Common to Environmental Engineering)
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Distinguish between Compression and Tension.

2. Define Poisson's ratio.

3. A simply supported beam of span 5 m carries a uniformly distributed load of intensity of 4 kN/m over the entire span. Determine the maximum Bending Moment.

4. How do you determine Shear Force at any section in a beam ?

5. Define Conjugate Beam.

6. How do you determine deflection in a beam using Moment Area method ?

7. Define Torsional Rigidity.

8. Write down any two assumptions in the derivation of Torsion equation.

9. Define Principal plane.

10. Distinguish between redundant frame and deficient frame.

PART – B (5×13=65 Marks)

11. a) i) A rod tapers uniformly from d_1 at one end to d_2 at other end. It is subjected to an axial Pull 'P'. Derive an expression to determine the extension of the rod. (7)

ii) A rod 2.50 m long tapers uniformly from a diameter of 65 mm at one end to 35 mm at other end. It is subjected to an axial pull of 25 kN. Assume Young's Modulus E = 210 GPa. Neglecting extension due to self weight, determine the extension of the bar. (6)

(OR)

b) A 3 m long thin cylinder is of 1000 mm internal diameter and 15 mm thickness. It is subjected to an internal pressure of 15 MPa. Assume Young's Modulus E = 200 GPa and Poisson's ratio 1/m = 0.30. Determine

i) hoop stress (3)

ii) longitudinal stress (3)

iii) change in length (3)

iv) change in diameter (2)

v) change in volume (2)

12. a) A cantilever of span 5m carries concentrated loads of 1 kN, 3 kN, and 2 kN at 2m, 3 m and 5 m from the fixed end respectively. Draw Shear Force Diagram and Bending Moment Diagram.

(OR)

b) A cast iron water main is 12 m long is simply supported at its ends. The internal diameter is 500 mm and its well thickness is 25 mm. Determine the maximum flexural stress induced. Assume unit weight of Cast Iron as 70.63 kN/m^3.

13. a) A beam AB of span 4 m is simply supported at its ends. The beam carries a concentrated load of 20 kN at 1 m from the support A and a uniformly distributed load of 10 kN/m in the right half span. Assume Flexural Rigidity EI = 4000 $kN.m^2$. Using Macaulay's method, determine i) Deflection in mid span ii) Maximum deflection iii) Slope at A.

(OR)

b) A cantilever 2m long carries a concentrated loads of 15 kN at mid span and 10 kN at the free end. Assuming Flexural Rigidity EI = 3000 $kN.m^2$, determine the slope and deflection at the free end using conjugate beam method.

14. a) A hollow circular shaft is required to transmit 600 kW power at 110 r.p.m. The maximum torque is 20% more than the mean torque. Assume that the diameter ratio as 3/8 and Modulus of Rigidity G = 80 kN/mm^2. Determine the external and internal diameters of the shaft.

(OR)

b) A closely coiled helical spring is made of 10 mm diameter steel rods. The coil consists of 10 complete turns and the mean diameter is 120 mm. The spring carries an axial pull of 200 N. Assuming G = 80 N/mm^2, determine i) deflection in the spring ii) strain energy stored iii) maximum shear stress.

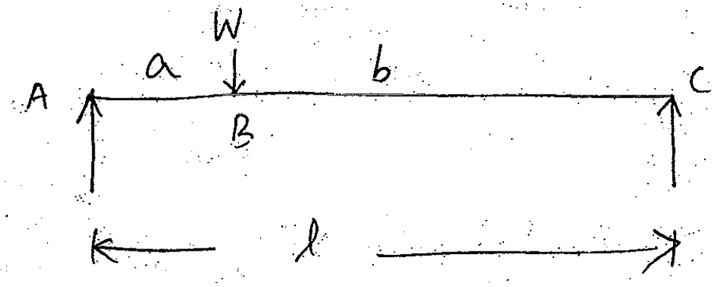
15. a) How do you determine the forces in the members of a Truss using method of joints ? Explain in detail.

(OR)

b) An element in a stressed material has tensile stress of 500 MN/m^2 and compressive stress of 350 NM/m^2 on two mutually perpendicular planes and shear stress of 100 MN/m^2. on these planes. Determine the principal stresses and location of principal planes. Also determine the maximum shear stress.

PART – C (1×15=15 Marks)

16. a) Derive relations for slope at the supports and maximum deflection for the beam given in fig Q. 16 a. Use Moment Area Method.



(OR)

b) i) What are the classification and advantages of springs. (6)

ii) Derive relation for deflection of an open coild helical spring subjected to axial load W. (9)