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Question Paper Code : 42243

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Third Semester

Civil Engineering

CE 2201 – MECHANICS OF SOLIDS

(Regulations 2008)

(Common to PTCE 2201 – Mechanics of solids for B.E. (Part-Time) Third Semester – Civil Engineering – Regulations 2009)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. State Hooke's Law.

2. Derive the relationship between Young's Modulus and Bulk Modulus.

3. What is a Perfect frame ?

4. What are the various methods involved in the analysis of a truss ?

5. What is called Point of Contraflexure ?

6. What is a Pure Bending region ?

7. State the first theorem of moment area method.

8. What is a Shear flow ?

9. What is the use of Closed Coil Helical Spring ?

10. Define Torsional Rigidity.

PART – B (5×16=80 Marks)

11. a) A bar of steel is 60 mm × 60 mm in section and 180 mm long. It is subjected to a tensile load of 300 kN along the longitudinal axis and tensile load of 750 kN and 600 kN on the lateral faces. Find the change in dimension of the bar and the change in volume. E = 200 GN/m^2 and 1/m = 0.3

(OR)

b) Draw the Mohr's stress circle for direct stresses of 65 MN/m^2 (tensile) and 35 MN/m^2 (comp) and estimate the magnitude and direction of the resultant stresses on planes making angles of 20° and 65° with the plane of first principal stress. Find also the normal and tangential stresses on the planes.

12. a) A cylindrical shell of 3 m long which is closed at the ends has an internal diameter of 1 m and a wall thickness of 15 mm. Calculate the circumferential and longitudinal stresses induced and also change in dimensions of the shell if it is subjected to an internal pressure of 1.5 MN/m^2.
Take E = 200 GN/m^2 and μ = 0.3.

(OR)

b) A built up cylindrical shell of 300 mm diameter, 3 m long and 6 mm thick is subjected to an internal pressure of 2 MN/m^2. Calculate the change in length, diameter and volume of the cylinder under that pressure if the efficiencies of longitudinal and circumferential joint are 80% and 50% respectively.
Take E = 200 GN/m^2 and m = 3.5.

13. a) Draw the shear force and bending moment diagrams for the beam shown in fig. 13 (a). Find out the position of maximum bending moment.

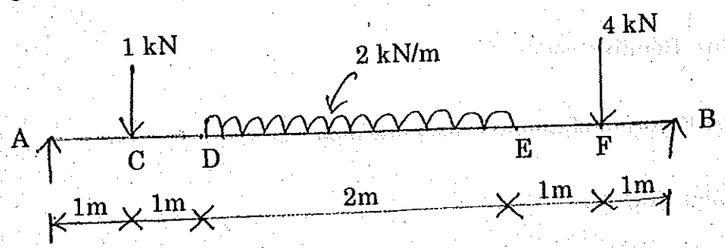

fig. Q.No. 13 (a)

(OR)

b) A beam consists of a symmetrical rolled steel joint. The beam is simply supported at its ends and carries a point load at the centre of the span. If the maximum stress due to bending is 140 MPa find the ratio of the depth of the beam section to the span in order that the central deflection may not exceed 1/480 of span. E = 200 GPa.

14. a) A cantilever of 3m length and of uniform rectangular cross section 150 mm wide and 300 mm deep is loaded with a 30 kN load at its free end. In addition to this it carries a udl of 20 KN/m run over its entire span calculate.
i) The maximum slope and maximum deflection.
ii) Slope and deflection at 2 m from fixed end. Take E = 210 GPa.

(OR)

b) A 2 m long cantilever of rectangular section 150 mm wide and 300 mm deep as shown in figure Q. No. 14 b. Calculate deflection at free end.
Take E = 10.5 GN/m^2.

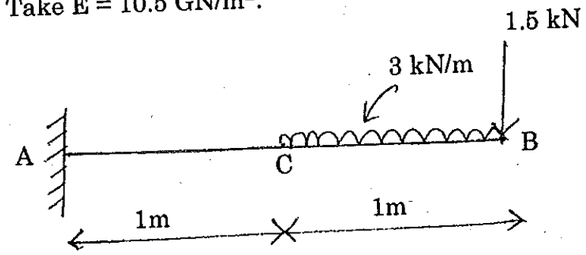

fig. Q. No. 14 (b)

15. a) Two shafts of the same material and same length are subjected to the same torque. If the first shaft is of solid circular section and the second shaft is of hollow circular section whose internal diameter is 2/3 of outside diameter and the maximum shear stress developed in each shaft is the same, compare the weights of the shaft.

(OR)

b) A closed coil helical spring of 100 mm mean diameter is consists of 20 turns. The spring carries an exial load of 200 N. Determine the shearing stresses. Take K = 84 GN/m^2 determine the deflection when carrying this load. Also calculate the stiffness of the spring.

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