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Question Paper Code : 80194

B.E/B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

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. Define Hooke's Law.
2. Define Poisson's ratio.
3. What is the relationship between SF and BM?
4. List out any two assumptions in simple bending.
5. Write the maximum value of deflection for a simply supported beam of constant EI, span L carrying central concentrated load W.
6. Where the maximum deflection will occur in a simply supported beam loaded with UDL of w kN/m run?
7. Why hollow circular shafts are preferred over solid circular shafts?
8. Define Torsional rigidity.
9. What is the use of Mohr's circle?
10. What are Deficient and Redundant frames?

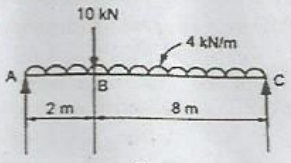
PART B — (5 × 13 = 65 marks)

11. (a) A Steel bar 300 mm long, 40 mm wide and 25 mm thick is subjected to a pull of 180 kN. Determine the change in volume of the bar. Take $E = 2 \times 10^5$ N/mm^2 and 1/m = 0.3.

Or

(b) An cylindrical shell 1 m diameter and 3 m length is subjected to an internal pressure of 2 MPa. Calculate the minimum thickness if the stress should not exceed 50 MPa. Find the change in diameter and volume of the shell. Poisson's ratio = 0.3 and E = 200 kN/mm^2.

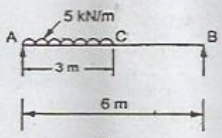
12. (a) A simply supported beam of span 10 m carries a concentrated load of 10 kN at 2 m from the left support and a uniformly distributed load of 4 kN/m over the entire length. Sketch the shear force and bending moment diagrams for the beam.



Or

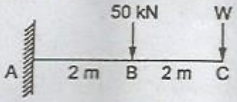
(b) Find the dimensions of a timber joist span 5 m to carry a brick wall 200 mm thick and 3.2 m high, if the weight of brickwork is 19 kN/m³ and the maximum stress is limited to 8 N/mm². The depth is to be twice the width.

13. (a) A SSB of span 6 m carries UDL 5 kN/m over a length of 3 m extending from left end. Calculate deflection at mid-span. $E = 2 \times 10^5$ N/mm², $I = 6.2 \times 10^6$ mm⁴.



Or

(b) A cantilever beam 4 m long carriers a load of 50 kN at a distance of 2 m from the free end, and a load of W at the free end. If the deflection at the free end is 25 mm, calculate the magnitude of the load W, and the slope at the free end. $E = 200$ kN/mm², $I = 5 \times 10^7$ mm⁴.



14. (a) A hollow shaft is to transmit 200 kW at 80 rpm. If the shear stress is not to exceed 70 MN/m² and internal diameter is 0.5 of the external diameter. Find the external and internal diameters assuming that maximum torque is 1.6 times the mean.

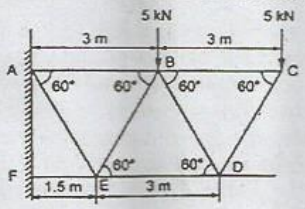
Or

(b) A closed coil helical spring is to deflect 1 mm under the axial load of 100 N at shearing stress of 90 N/mm². The spring is to be made of round wire having rigidity modulus of 80×10^4 N/mm². The mean diameter of the spring is to be 10 times the diameter of the wire. Find the diameter and length of the wire necessary to form the spring?

15. (a) An element has a tensile stress of 600 N/mm² acting on two mutually perpendicular planes and shear stress of 100 N/mm² on these planes. Find the principal stress and maximum shear stress.

Or

(b) Determine the forces in all members of a cantilever truss as shown in Fig.



PART C — (1 × 15 = 15 marks)

16. (a) Draw SFD and BMD for a cantilever with single concentrated load at free end.

Or

(b) Derive the equations for maximum slope and deflection of a Simply Supported Beam (SSB) with central point load.

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