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Question Paper Code : 97026

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Third Semester

Civil Engineering

CE 6302 — MECHANICS OF SOLIDS

(Common to Environmental Engineering)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Poisson's ratio.

2. Define Bulk modulus.

3. What is meant by cantilever beam?

4. Explain bending moment.

5. Name any two methods of determining the deflection of beams.

6. What are determinate beams?

7. Define pure torsion.

8. Write the equation for power transmitted by a shaft.

9. What is Mohrs circle?

10. List the methods of analysing plane trusses.

PART B — (5 × 16 = 80 marks)

11. (a) A hollow cast iron cylinder 4m long, 300 mm outer diameter, and thickness of metal 50mm is subjected to a central load on the top when standing straight. The stress produced is 75000 kN/m^2, assume Young's modulus for cast iron as 1.5×10^8 kN/m^2 and find (i) magnitude of the load, (ii) Longitudinal strain produced and (iii) total decrease in length.

Or

(b) A flat steel plate of trapezoidal form of uniform thickness of 20 mm tapers uniformly from a width of 100 mm to 200 mm in a length of 800 mm. If an axial tensile force of 100 kN is applied at each end, find the elongation of the plate.

12. (a) A cantilever beam 1.5 meter long, fixed at A is carrying paint loads of 1000 kg at B, C and D each and at distances of 0.5 meter, 1.0 meter and 1.5 meter from the fixed end. Calculate the shear force and bending moments at salient points.

Or

(b) A simply supported beam AB of span 4 meters is subjected to two point loads of 2 kN and 4 kN each at C and D, distances of 1.5 m and 3 m from the left end. Calculate the shear force and bending moment values at salient points.

13. (a) A horizontal beam of uniform section and 6 meters long is simply supported at its ends. Two vertical concentrated loads of 48 kN and 40 kN act at 1m and 3m respectively from the left hand support. Determine the position and magnitude of the maximum deflection, using Macaulays method. If $E = 200$ GN /m^2 and $I = 85 \times 10^{-6}$ m^4.

Or

(b) A cantilever of length "2a" is carrying a load of W at the free end, and another load of W at its centre. Determine the slope and deflection of the cantilever at the free end, using conjugate beam method.

14. (a) A close coiled helical spring is to carry a load of 100 N and the mean coil diameter is to be 8 times that of the wire diameter. Calculate these diameters, if the maximum stress is to be 10 N/mm^2.

Or

(b) An open coil helical spring made of 10mm diameter wire and of mean diameter 10 cm has 12 coils, angle of helix being 15 degrees. Determine the axial deflection and the intensities of bending and shear stress under a load of 500 N. Take C as 80 kN/mm^2 and $E = 200$ kN/mm^2.

15. (a) The principal stresses in the wall of a container are 40 MN/m^2 and 80 MN/m^2. Determine the normal, shear, and resultant stresses in magnitude and direction in a plane, the normal of which makes an angle of 30° with the direction of maximum principal stress.

Or

(b) The principal stresses at a point across two perpendicular planes are 75 MN/m^2 (tensile) and 35 MN/m^2 (tensile). Find the normal, tangential stresses and the resultant stress and its obliquity on a plane at 20° with the major principal plane.
