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Question Paper Code : 57143

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

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. State Hooke's Law.
2. What is the use of Mohr's Circle ?
3. Sketch the shear stress variation for symmetrical I section.
4. What is the differential relation between bending moment, shear force and the applied load ?
5. When do you prefer Moment area method ?
6. Explain the theorem of conjugate beam method.
7. A circular shaft is subjected to a torque of 10 kNm. The power transmitted by the shaft is 209.33 kW. Find the speed of shaft in revolution per minute ?
8. Compare close coiled and open coiled springs under the action of an axial load.
9. What is meant by Circumferential stress (or hoop stress) and Longitudinal stress ?
10. What are the formula for finding principal stresses of a thin cylindrical shell Subjected to internal fluid pressure p and a torque ?

PART – B (5 × 16 = 80 Marks)

11. A tensile test was conducted on a mild steel bar. The following data was obtained from the test :

(i) Diameter of the steel bar = 3 cm

(ii) Gauge length of the bar = 20 cm

(iii) Load at elastic limit = 250 kN

(iv) Extension at a load of 150 kN = 0.21 mm

(v) Maximum load = 380 kN

(vi) Total extension = 60 mm

(vii) Diameter of rod at failure = 2.25 cm

Determine :

(1) The Young's modulus **(4)**

(2) The stress at elastic limit **(4)**

(3) The percentage of elongation **(4)**

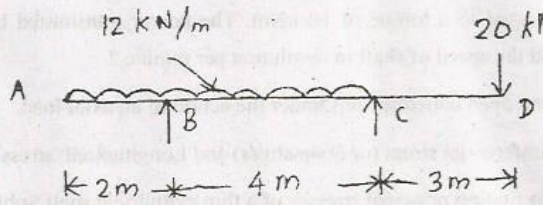
(4) The percentage decrease in area. **(4)**

OR

(a) Derive the relationship between bulk modulus and Young's modulus. **(6)**

(b) Derive relations for normal and shear stresses acting on an inclined plane at a in a stained material subjected to two mutually perpendicular direct stresses. **(10)**

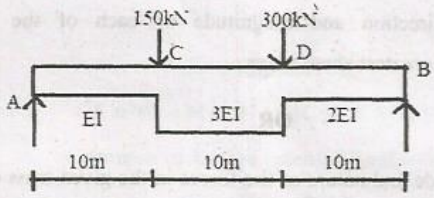
12. (a) Draw shear force and bending moment diagram for the beam given in Fig.



OR

(b) The cross section of T beam is as follows : Flange thickness = 10 mm; width of the flange = 100 mm; thickness of the web = 10 mm; depth of the web = 120 mm; If a shear force of 2 kN is acting at a particular section of the beam, draw the shear stress distribution across the section.

13. (a) Using conjugate beam method, obtain the slope and deflections at A, B, C and D of the beam shown in fig. Take E = 200 GPa and $I = 2 \times 10^{-2}$ m^4.



OR

(b) A beam of length 6 m is simply supported at its ends and carries two point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support.

Find :

(i) Deflection under each load

(ii) Maximum deflection

(iii) The point at which the maximum deflection occurs.

Take $I = 85 \times 10^6$ mm^4, $E = 2 \times 10^5$ N/mm^2

14. (a) It is required to design a close coiled helical spring which shall deflect 1 mm under and axial load of 100 N at a shear stress of 90 MPa. The spring is to be made of round wire having shear modulus of 0.8×10^5 MPa. The mean diameter of the coil is to times that at the coil wire. Find the diameter and length of the wire.

OR

(b) A shaft has to transmit 110 kW at 160 rpm. If the shear stress is not to exceed 65 N/mm^2 and the twist in a length of 3.5 m must not exceed 1°, find a suitable diameter. Take C = 8×10^4 N/mm^2.

15. (a) A rectangular block of material is subjected to a tensile stress of 110 N/mm^2 on one plane and a tensile stress of 47 N/mm^2 on the plane at right angle to the former. Each of the above stress is accompanied by a shear stress of 63 N/mm^2. Find (i) The direction and magnitude of each of the principal stress (ii) Magnitude of greatest shear stress.

OR

(b) Find the magnitude and nature of the forces in the given truss carrying loads as shown in Fig.

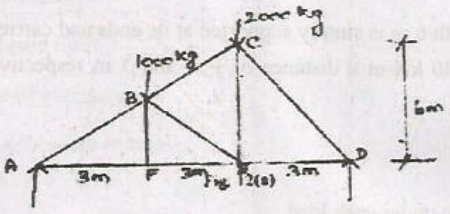


Fig. 12(a)