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EI-183

B.E. (Illrd Sem.) (CGPA) Civil Engg. Exam.-2015

MECHANICS OF MATERIAL

Paper - CE - 302

Time Allowed : Three Hours

Maximum Marks : 60

- Q.1 A steel rod 20 mm diameter is passed through a brass tube 25 mm internal diameter and 30 mm external diameter. The tube is 80 cm long and is closed by thin rigid washers and fastened by nuts, screwed to the rod. The nuts are tightened until the compressive force in the tube is SKN. Calculate the stresses in the rod and in the tube. 12

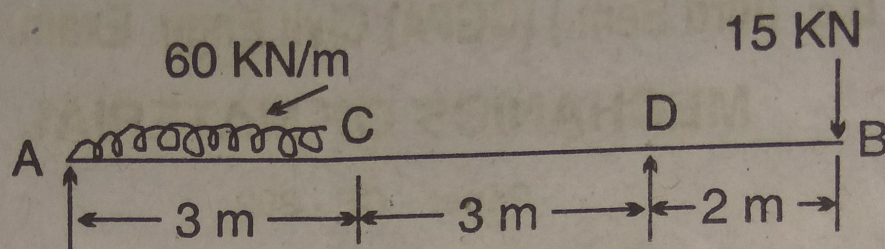
Or

At a point in a material subjected to two direct stresses on planes at right angles, the resultant stress on a plane A is 80 MPa inclined at 30° to the normal, and on plane B is 20 MPa inclined at 45° to the normal. Find the principle stresses and show the position of the two planes 'A' and 'B' relative to the principle stresses.

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P.T.O.

- Q.II Draw the bending moment and shear force diagram for the given beam and locate the point of contraflexure, if any 12



Or

- (a) Write short notes on section modulus and flexural rigidity. 4
- (b) A rectangular beam 300 mm deep is simply supported over a span of 4m. What UDL the beam may carry if the bending stress is not to exceed 120 MPa?

Take $I = 8 \times 10^6 \text{ mm}^4$

- Q.III A steel bar $20 \text{ mm} \times 30 \text{ mm}$, 2 meter long is subjected to gradually increasing axial compressive load. Find the buckling load using Euler's formula. Find also the maximum lateral deflection corresponding to the buckling conditions. Both ends of the rod may be taken as hinged. Take $E = 2.1 \times 10^5 \text{ N/mm}^2$ and the yield stress to steel is 240 N/mm^2 12

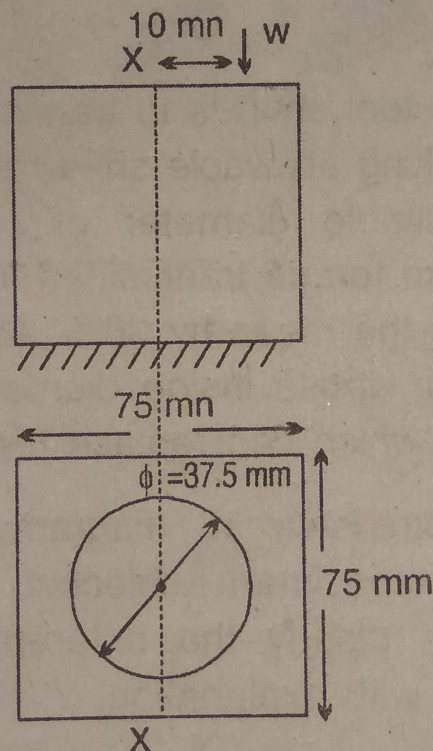
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Or

A column $75 \text{ mm} \times 75 \text{ mm}$ has a circular cavity of 37.50 mm in diameter. Find the maximum value of load that can be applied at an eccentricity of 10 mm with respect to xx axis in order the maximum compressive stress may reach 80 N/mm^2

12

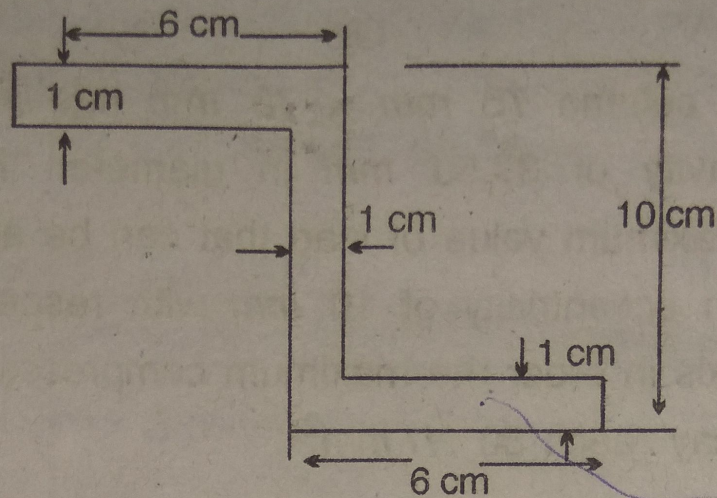


Q.IV A Z-section shown in the fig. is subjected to a bending moment of 2 kN due to loads acting in a plane making an angle of 30° with the vertical axis. Determine the bending stresses at A, B, C and D.

12

(4)

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Or

A solid steel shaft is to transmit 75 KW at 200 rpm. Taking allowable shear stress as 70 Mpa. Find suitable diameter of the shaft, if the maximum torque transmitted in each revolution exceeds the mean by 30%. Also find the outer diameter whose inside diameter is 0.7 of the outside, which can replace the solid shaft.

Q.V ✓ Draw stress-strain diagram for a ductile material specimen subjected to tensile force. Indicates clearly the different points on the diagram with explanation. 12

Or

- (a) Discuss the salient feature of fatigue testing of a material. 6
- (b) What is Izod impact test. How it is different from charpy impact test. 6