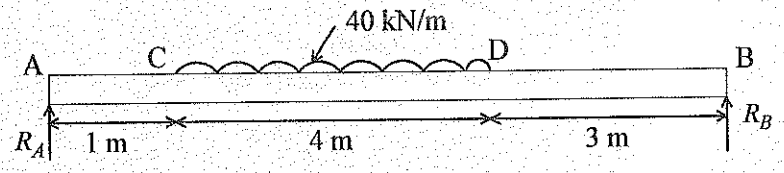
b. A beam of length 8 m is supported simply at its ends. It carries UDL of 40 kN/m. Determine the deflection of the beam at its midpoint. Take $E = 2 \times 10^5$ N/mm^2, $I = 4.3 \times 10^8$ mm^4.



15. a. A hollow cylindrical cast iron column is 4 m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of safety of 5. Take the internal diameter as 0.8 times the external diameter. Take $\alpha_c = 550$ N/mm^2 and a = 1/1600 in Rankine's formula.

(OR)

b. A boiler is subjected to an internal steam pressure of 2 N/mm^2. The thickness of boiler plate is 2.6 cm and permissible tensile stress is 120 N/mm^2. Find out the maximum diameter, when efficiency of longitudinal joint is 90% and that of circumferential joint is 40%

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Reg. No.										

B.Tech. DEGREE EXAMINATION, NOVEMBER 2013
Fourth Semester

ME0204 – MECHANICS OF SOLIDS
(For the candidates admitted from the academic year 2007-2008 to 2012-2013)

Time: Three hours Max. Marks: 100

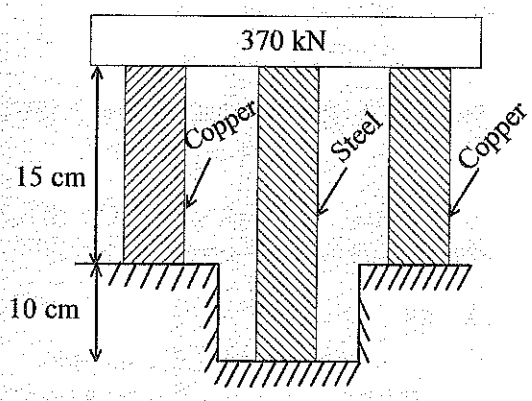
Answer ALL Questions

PART – A (10 × 2 = 20 Marks)

1. State Hooke's law.
2. Define principal plane and principal stresses.
3. What do you mean by point of contraflexure?
4. Define shear force diagram and bending moment diagram.
5. Define torsional rigidity of a shaft.
6. Define helical springs. Name the two important types of helical springs.
7. Write the deflection equation of a simply supported beam carrying a point load at the centre.
8. What is moment area method? Where is it conveniently used?
9. Define slenderness ratio.
10. Define thin cylinders. Name the stresses set up in a thin cylinder subjected to internal fluid pressure.

PART – B (5 × 16 = 80 Marks)

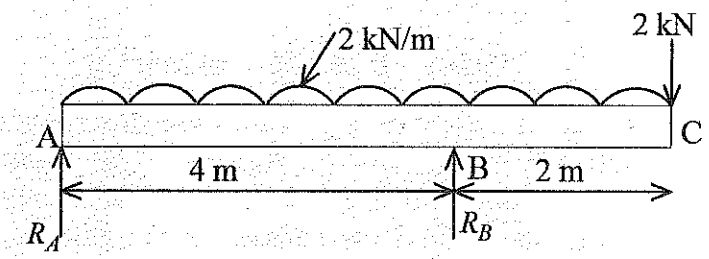
11. a. A steel rod and two copper rods together support a load of 370 kN as shown in figure. The cross sectional area of steel rod is 2500 mm^2 and each copper rod is 1600 mm^2. Find the stresses in the rods. Take E for steel = 2×10^5 N/mm^2 and for copper = 1×10^5 N/mm^2.



(OR)

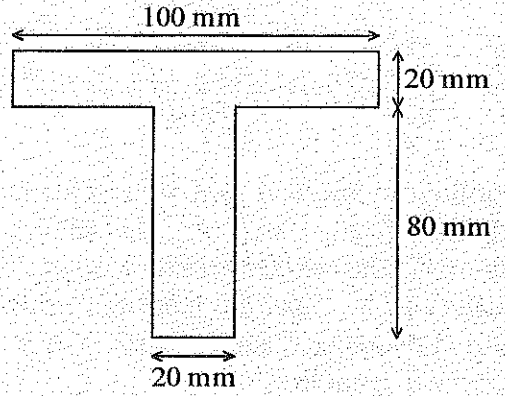
b. At a point within a body subjected to two mutually perpendicular directions the stresses are 65 N/mm^2 (tensile) and 35 N/mm^2 (tensile). Each of above stresses is accompanied by a shear stress of 25 N/mm^2. Using Mohr's circle method, determine the normal, tangential and resultant stresses on an oblique plane inclined at an angle of 45° with the axis of minor tensile stress. Check the answer analytically.

12. a. Draw the S.F. and B.M. diagrams for the overhanging beam carrying UDL of 2 kN/m over the entire length and a point load of 2 kN as shown in figure. Locate the point of contraflexure.



(OR)

b. A cast iron beam is of T-section as shown in figure. The beam is simply supported on a span of 8 m. The beam carries a UDL of 1.5 kN/m length on entire span. Determine the maximum tensile and maximum compressive stresses.



13. a. A hollow shaft having an inside diameter 60% of its outer diameter is to replace a solid shaft transmitting the same power at the same speed. Calculate the percentage saving in material, if the material to be used is also the same.

(OR)

b. A close coiled helical spring of 10 cm mean diameter is made up of 1 cm diameter rod and has 20 turns. The spring carries an axial load of 200 N. Determine the shearing stress. Taking G = 8.4 × 10^4 N/mm^2, determine the deflection when carrying this load. Also calculate the stiffness of spring.

14. a. 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 left support. Using Macaulay's methods, find (i) deflection under each load (ii) maximum deflection. E = 2 × 10^5 N/mm^2 and I = 85 × 10^6 mm^4.

(OR)