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Total Number of Pages: 2

**B.Tech**  
**PCME4202**

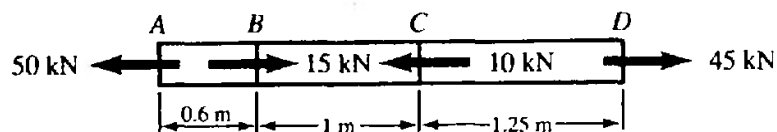
**3<sup>rd</sup> Semester Back Examination 2016-17**  
**MECHANICS OF SOLIDS**  
**BRANCH(S): AUTO, CIVIL, MECH, MINERAL, MINING**  
**Time: 3 Hours**  
**Max Marks: 70**  
**Q.CODE: Y499**

**Answer Question No.1 which is compulsory and any five from the rest.**  
**The figures in the right hand margin indicate marks.**

**Q1 Answer the following questions: (2 x 10)**

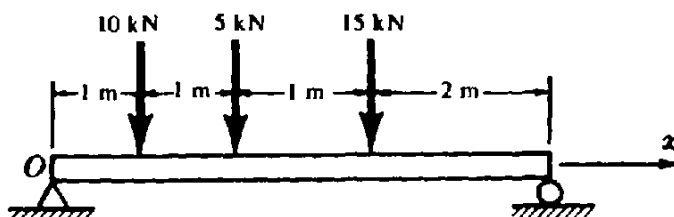
- Define the term factor of safety and its importance.
- What is complimentary shear stress?
- What is resilience?
- What is temperature stresses?
- Define Principal stress.
- What is the value of maximum bending moment for a simply supported beam of length 'L' and carrying a point load 'W' at mid span.
- Describe the advantage of hollow shaft over solid shaft.
- What is critical load in buckling?
- What is the value of shear stress at the centre of a circular shaft under torsion?
- Write the assumptions in the theory of pure torsion.

**Q2 a) A steel bar of cross section 500 mm<sup>2</sup> is acted upon by the forces shown in Fig. below. Determine the total elongation of the bar. For steel, consider E = 200 G Pa. (5)**



**b) A square steel bar is 50 mm on a side and 250 mm long. It is loaded by an axial tensile force of 200 kN. If E = 200 GPa and poisson's ratio  $\mu = 0.3$ , determine the change of volume per unit volume. (5)**

**Q3 Draw the shear force and bending moment diagram of a beam 5 meters long is simply supported at the ends as shown in figure below. (10)**

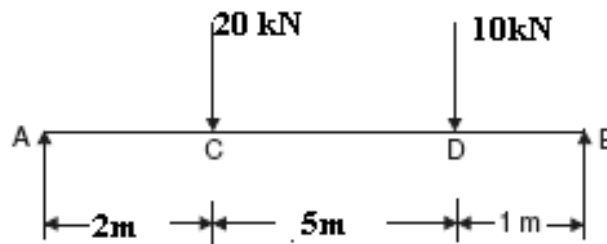


Q4 a) Prove the relation  $\frac{\sigma}{y} = \frac{M}{I} = \frac{E}{R}$ , Symbols has their usual meaning. (5)

b) A simply supported beam of length 800mm and cross section diameter 15mm, fails on applying 360N at the midspan. Determine the maximum magnitude of the uniformly distributed load that can safely applied to this beam. (5)

Q5 Determine the deflection of the simply supported beam at C and D. Find the position of the maximum deflection and the value of it. (10)

Assume  $E = 210 \text{ GPa}$ ,  $I = 6000 \text{ cm}^4$ .



Q6 a) What is critical load to avoid buckling? Determine the critical load for a long slender bar clamped at one end, pinned at the other, and loaded by an axial compressive force applied at the pinned end. (5)

b) Calculate the buckling load of a strut fixed at both ends, the cross-section being a square 1 cm by 1 cm, and the length 2 m. Take  $E = 200 \text{ GN/m}^2$ . (5)

Q7 a) A steel tube, 3 m long, 3.75 cm diameter, 0.06 cm thick, is twisted by a couple of 50 Nm. Find the maximum shearing stress, the maximum tensile stress, and the angle through which the tube twists. Take  $G = 80 \text{ GN/m}^2$ . (5)

b) A 400mm long shaft with a diameter of 40mm carries a flywheel weighing 3kN in the mid way. The shaft transmits 12kW at 200rpm. Determine the principal stresses. (5)

Q8 Write short answer on any TWO: (5 x 2)

a) Describe the steps to draw Mohr's circle for strain.

b) Explain Principle of St.Venant,

c) Slope and deflection of beams area - moment method.

d) Euler's column formula for different boundary conditions.