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Total No. of Questions : 09] [Total No. of Pages : 03

Paper ID [A0604]

(Please fill this Paper ID in OMR Sheet)

B.Tech. (Sem. - 3rd)

SOLID MECHANICS (CE - 207)

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 × 2 = 20)*

a) Define Poisson's ratio.

b) When a nut is tightened on the bolt, what is the nature of stress in the bolt?

c) What do principal stresses mean?

d) What is the nature of variation of bending moment due to UDL?

e) What does neutral axis of a beam mean?

f) Write the expression for maximum deflection of a simply supported beam of span l carrying a concentrated load W at the centre of the beam.

g) Two shafts having same length and material are joined in series. If the ratio of their diameters is 2, then what is the ratio of their shear stresses?

h) Write the torsion formula for circular shafts, explaining each term.

i) Define resilience.

j) Differentiate between a column and strut.

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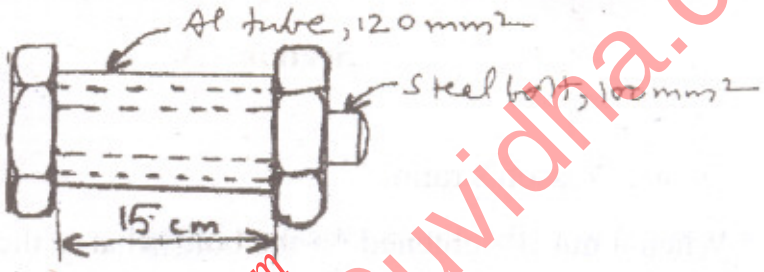
Section - B

(4 × 5 = 20)

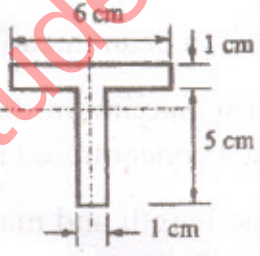
Q2) Discuss briefly the theories of failure for brittle material.

Q3) A solid steel propeller shaft transmits 50 kW of power at 500 rpm without exceeding the shear stress of 80 MPa or twisting through more than 2° in a length of 2 m. Compute the smallest acceptable diameter of the shaft. Use G = 83 GPa.

Q4) An aluminium tube is axially compressed between a nut and a steel bolt (Figure given below). If the tube carries the axial compressive stress of 20 MPa at 100°C, determine the axial stresses in the tube and the bolt at 150°C. Take E_{al} = 70 GPa, $\alpha_{al} = 23.2 \times 10^{-6}$/°C, E_{st} = 200 GPa, $\alpha_{st} = 11.7 \times 10^{-6}$/°C.



Q5) A beam having the T-section as shown in figure below is subjected to a bending moment of 24 kN-m about the horizontal axis. Find the maximum tensile and compressive bending stresses developed in the beam.



Q6) An aluminium tube of length 8 m is used as a column with hinged ends carrying a 1.2 kN axial compressive load. If the outer diameter of the tube is 50 mm, compute the limiting value of the inner diameter that would be safe against buckling. Use E = 70 GPa for aluminium.

Section - C

(2 × 10 = 20)

Q7) The simply supported beam ABC (Figure given below) carries the uniformly distributed load between its supports and the concentrated load P at end C. Find the value of P for which

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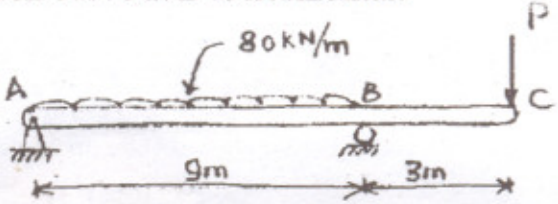
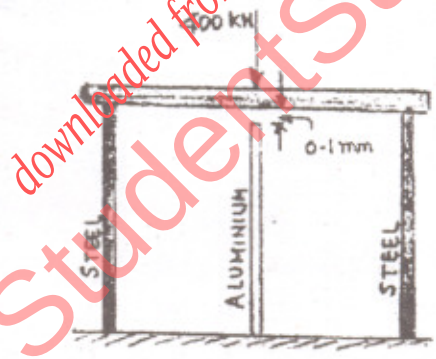
(a) There is no deflection at C.

(b) The deflection curve at B is horizontal.

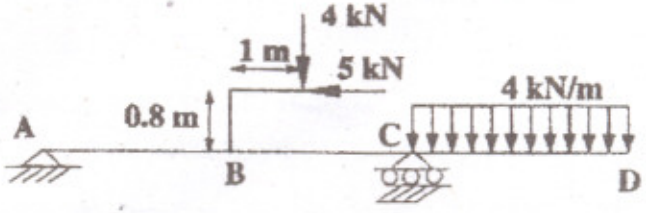


EI is constant

Q8) Before the 400 kN load is applied, the rigid platform rests on two steel bars, each of cross-sectional area 1200 mm^2, as shown in figure below. The cross-sectional area of the aluminium bar is 2400 mm^2. Compute the stress in the aluminium bar after the 400 kN load is applied. Use E = 200 GPa for steel and E = 70 GPa for aluminium. Neglect the weight of the platform.



Q9) Draw the axial force; shear force and bending moment diagrams for the beam ABCD shown in figure below. Clearly indicate the values at important points. AB = BC = CD = 2 m.



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