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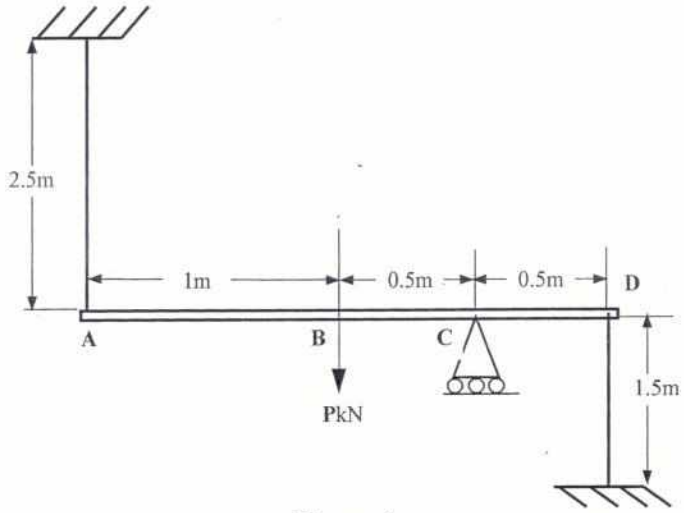
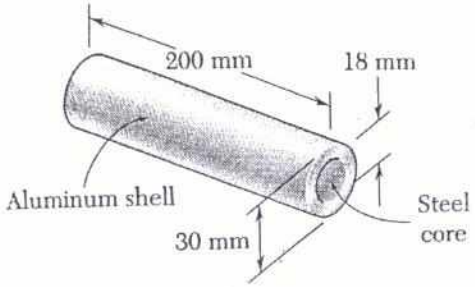
Thapar University, Patiala

Mid Semester Examination

B. E. (Second Year): Semester-II (2016/17) (COE, SEM, CML, CAG, ECE, ENC)	Course Code: UES010 Course Name: Solids and Structures
March 21, 2017	Tuesday, 08.00 – 10.00 Hrs
Duration: 2 Hours M. Marks: 50	Name Of Faculty: RSQ, SHG,NG, SHR, APH, DJ,GB, SB, RG, DN

Note: Attempt all questions. Assume missing data suitably (if any).Please mention the page number for each question on the answer booklet.

Q1	The pin connected assembly, as shown in **Figure 1,** consists of rigid beam ABCD and two supporting bars. Bar (1) of 2.5 m is made up of bronze alloy (E = 105 GPa) with a cross sectional area of A_1 = 290 mm^2. Bar (2) of 1.5 m is made up of aluminium alloy (E = 70 GPa) with a cross sectional area of A_2 = 650 mm^2. If a load of P = 30 kN is applied at B. Determine: (a) The normal stresses in both bars (1) and (2) (b) The downward deflection of point A on the rigid bar  Figure 1	12
Q2	The assembly consists of an aluminium shell (E_{al} = 73 GPa, α_{al}= 23.2 x 10^{-6} /°C) fully bonded to a steel core (E_s = 200 GPa, α_s= 11.7 x 10^{-6} /°C) and is unstressed as shown in **Figure 2**. The rise in temperature of the assembly is 64 °C. Calculate the stresses in the aluminium shell and steel core due to the rise in temperature.  Figure 2	8

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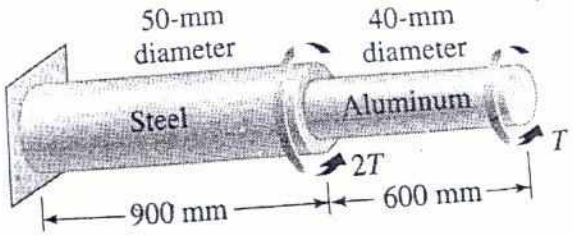
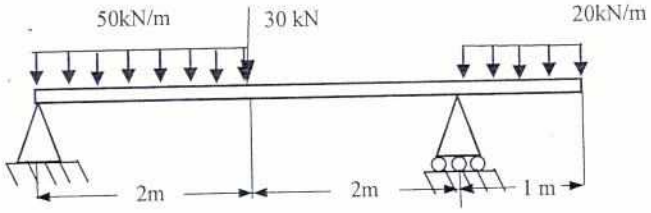
Q3	The compound shaft consisting of steel and aluminium segments carries two torques, as shown in **Figure 3**. Determine the maximum permissible values of T subject to the following design conditions: $\tau_{st} \leq 80$ MPa, $\tau_{al} \leq 55$ MPa and $\theta \leq 6^{\circ}$ (where θ is the angle of rotation at the free end). Use G = 83 GPa for steel and G = 28 GPa for aluminium.  Figure 3	10
Q4	A bar of cross section 100 mm x 150 mm is extended by 0.025 mm on a length of 4 m when a tensile load of 10kN is applied. Find the Euler's critical load of this bar when used as a column with one end fixed and other end hinged.	6
Q5	Construct the Shear force and Bending moment diagram for the beam as shown in **Figure 4**. Also, mark all the salient points in the diagram.  Figure 4	14

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