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Seat No.	

S.E. (Civil) (Part - II) (Semester - III) (Revised) Examination, May - 2016

STRENGTH OF MATERIALS - I

Sub. Code : 63340

Day and Date : Monday, 02 - 05 - 2016 **Total Marks : 100**

Time : 03.00 p.m. to 06.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of the electronic calculator is permitted.**
4) **Assume suitable data if necessary and mention it clearly.**

SECTION - I

Q1) a) Define the following terms: **[3]**

i) Poisson's ratio ii) Hydrostatic state of stress

iii) Temperature stress

b) An aluminium bar of 700 mm length is suspended from ceiling so that there is initial gap of 0.3 mm between steel bar of 250 mm length as shown in fig. 1. Load of 300 kN is applied. Determine the stresses in aluminium and steel bars. E_s = 210 GPa, E_{al} = 70 GPa, A_s = 2500 mm^2 and A_{al} = 1250 mm^2. **[13]**

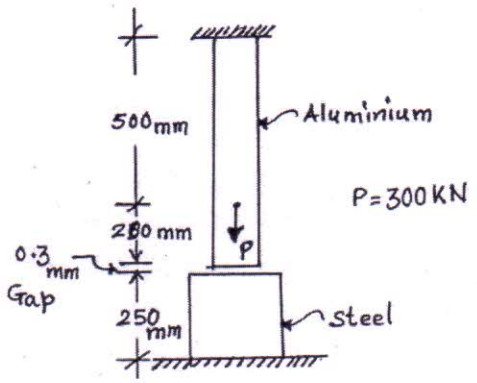

Fig. 1

P.T.O.

Q2) a) Explain the following terms: **[4]**

i) Sagging and hogging bending moment

ii) Point of contraflexure

b) Construct S.F. and B.M. diagrams for the beam shown in fig. 2. **[13]**

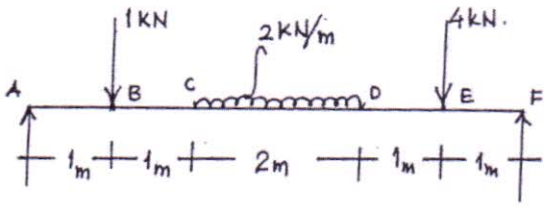

FIG 2

Q3) a) Derive the relationship for volumetric strain in terms of longitudinal strains for 3 - D state of stress. **[8]**

OR

Derive the expressions for circumferential and longitudinal stresses in thin cylinder subjected to internal pressure.

b) A hollow circular shaft with internal dia. = 0.7 external dia. transmits 294 kW at 200 r.p.m. Find the diameters of the shaft if shear stress is not to exceed 68.6 MPa. Take G = 80 GPa. **[9]**

OR

Calculate the thickness of the metal required for C.I. pipe of 800 mm dia. Carrying water at pressure head of 100 m if max. permissible tensile stress is 40 MPa and unit weight of water is 10 kN/cum. What will be the longitudinal stress then? Take F.S. = 2.

SECTION - II

Q4) A timber beam of depth 300 mm and symmetrical section is simply supported over a span of 10 m. What uniformly distributed load (including its own weight) can it carry if the maximum permissible bending stress is 7.5 N/mm^2. The moment of inertia of the section of the beam is 450×10^6 mm^4. Also find the maximum bending stress and the radius of curvature at a section 1 m from a support. E for timber = 12.6×10^3 N/mm^2. **[17]**

OR

A pipe having a bore of 500 mm and metal thickness 50 mm is simply supported at its end over a span of 4 m. Find the intensity of maximum bending stress when it is full of water. The metal weights 70 kN/m^3 and water weights 10 kN/m^3.

Q5) a) Draw shear stress distribution diagram for rectangular and T section. **[4]**

b) A laminated wooden beam 10 cm × 15 cm is made of three 10 cm × 5 cm planks glued together to resist longitudinal shear. The beam is simply supported over a span of 2 m. If the allowable shearing stress in the glued joint is 0.45 MN/m^2, find the safe concentrated load that the beam may carry at its centre. **[13]**

Q6) A unknown weight falls by 30 mm on to a collar rigidly attached to the lower end of a vertical bar 4 m long and 1000 mm^2 in cross section. If the maximum instantaneous extension is found to be 3.66 mm, find the corresponding stress and the value of the unkown weight. E = 200 GPa. **[16]**