Submission Date:

ASSIGNMENT 1

1. Two bars A and B are connected by a bolt of 25 mm diameter as shown in the following Figure 1. The cross-section of bar A is rectangular 25mm x 62 mm and that of bar B is circular 50 mm in diameter. If the bars are subjected to a load of 100 kN, *evaluate* the tensile stress in two bars and shear stress in the bolt.

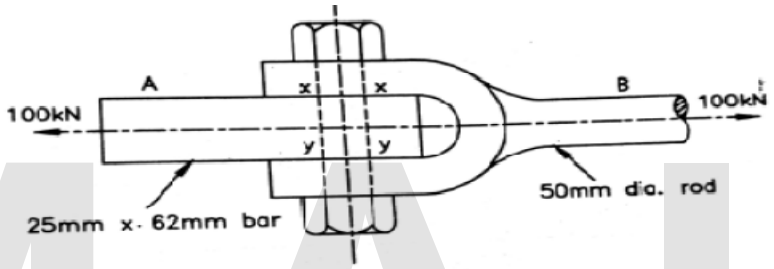

Figure 1

2. A steel rod of 10 mm diameter passes centrally through a copper tube of external diameter 40 mm and internal diameter 30 mm and of length 2m. The tube is closed at each end by 20 mm thick steel plates which are screwed by the nuts. The nuts are tightened until the copper tube is reduced to a length 1.9996 m. *Evaluate* the stresses in the rod and the tube.

If the whole assembly is heated through 60ºC, then *evaluate*the stresses in the rod and the tube, assuming that the thickness of the plates remain unchanged?

Take, E_s= 210 GN/m^2, E_c= 100 GN/m^2, α_s = 12 x 10^{-6} per ºC, and α_c = 17.5 x 10^{-6} per ºC.

3. *Evaluate* the change in volume of a 10 cm diameter of solid steel sphere when it is immersed to a depth of 1000 m in sea water. Unit weight of sea water is 0.01025 N/cm^3. The modulus of elasticity and the rigidity modulus of sea water is 200 GPa and 80 GPa respectively.

4. A block of size 200 mm x 80 mm x 20 mm is subjected to the forces as shown in Figure 2. *Evaluate* i) change in dimensions and ii) change in volume. Take E = 200 GPa and 1/m = 0.3.

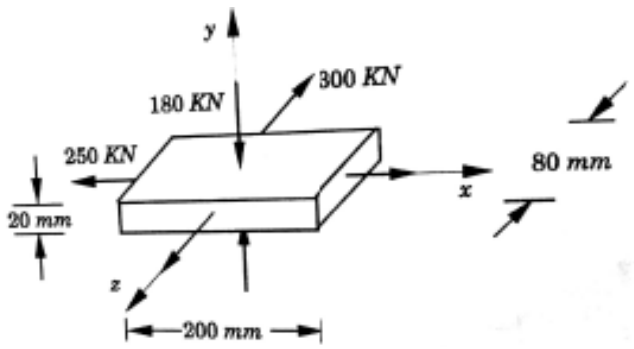

Figure 2

5. *Evaluate* the magnitude of load ***W*** that can be applied on a composite bar shown in Figure 3. Allowable stresses are σ_{Al} = 130 MPa and σ_{cu}= 65 MPa. Take E_{cu}= 70 GPa, E_{Al}= 120 GPa.

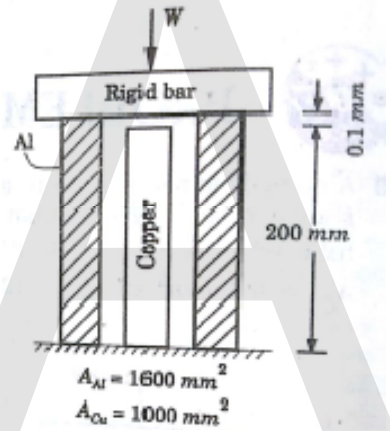

Figure 3

6. A 1.2 m long bar of 280 mm^2 cross-sectional area is rigidly fixed between two supports in vertical position. Forces of magnitude 20 kN and 10 kN are applied on the member as shown in Figure 4.*Evaluate*the stresses induced in different portions of the member.

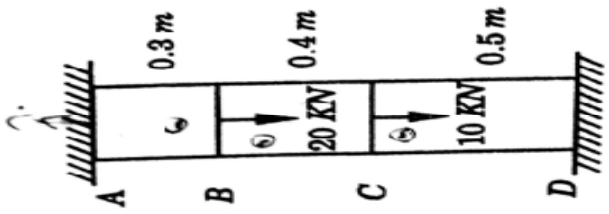

Figure 4