THAPAR INSTITUTE OF ENGINEERIONG AND TECHNOLOGY, PATIALA
UES 010: SOLIDS AND STRUCTURES

B.E. – 2nd Year (CIE, MP, MEE) **Session: 2020-2021**
Tutorial Sheet No. 4 **(Indeterminate Structures)**

1. Determine the deflection of the free end of the steel rod (**Fig. 1**) under the given load (E= 200 GPa).
2. A composite bar as shown in **Fig. 2**, is firmly attached to unyielding supports at the ends and is subjected to the axial load F. If the aluminium is stressed to 70 MPa, what is the stress in the steel?
3. Determine the stresses in each wires supporting the rigid bar as shown in **Fig.3** if **F=20 kN**
4. A 350mm long steel bolt having a nominal diameter of 20mm and a thread pitch of 2.4 mm is used to connect two plates of 10mm thickness each. An aluminium spacing tube of internal and external diameters of 22 and 44 mm. respectively, separates the plates. If the nut is initially tightened snug (just tight), determine the stresses induced in the tube and in the bolt if the nut is given one-third additional turn. Neglect the deformation in the plates. E_{st} = 207 GPa, E_{Al} = 67.5 GPa. (**See Fig. 4**)
5. Two steel rods and one brass rod, each of 30mm diameter are arranged vertically to take load of 25 kN as shown in **Fig. 5** below. Find stresses in steel and brass rods. Take E_{st} = 200 GPa and E_b = 100 GPa.

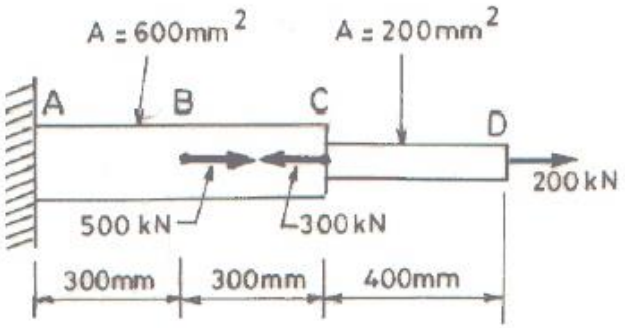

Fig. 1

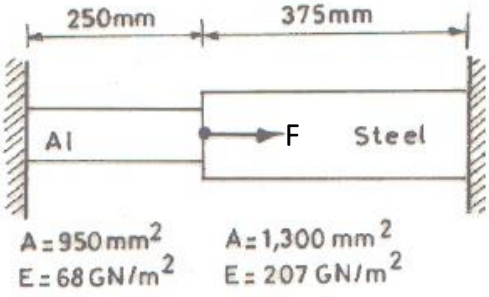

Fig. 2

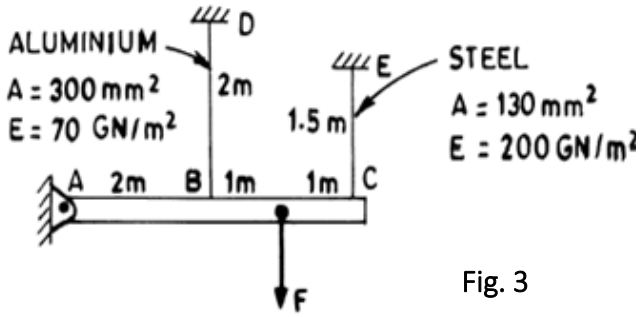

Fig. 3

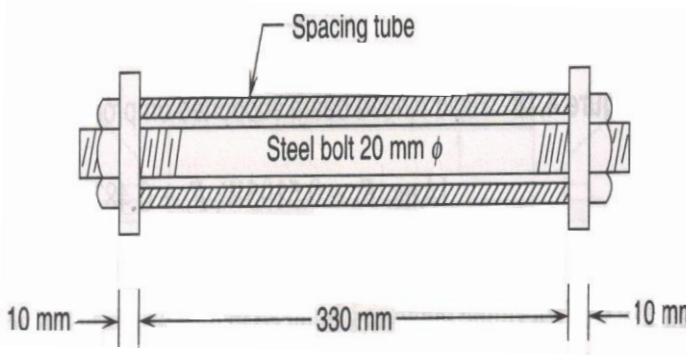

Fig. 4

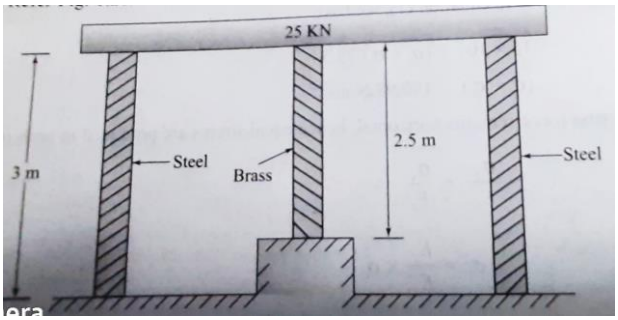

Fig. 5