1. The high-strength steel (E=200Gpa) bar AC has a cross-sectional area of 400 mm², the bronze (E=100Gpa) post D has a cross-sectional area of 2000 mm², and the bar AB and the bearing block on post D are to be considered rigid. The clearance δ between post D and bar AB is 0.1 mm before the load P is applied. If the load P is known as 40 kN, Determine:
(a) The axial stresses in the steel and in the bronze.
(b) The vertical displacement of the point of application of the load P.
[25%]

2. Draw complete shear and moment diagrams for the beam segment in Figure 2.
[25%]

3. A 20mm diameter solid circular steel shaft is bent to a quarter ring with nominal radius 100 mm as shown in Figure 3. While one end is fixed to the wall, the other end is loaded by a force V in y direction, which is parallel to the wall. If the maximum normal and shearing stresses at point A and B must be limited to 100MPa T and 50MPa, respectively, determine the maximum permissible value for the transverse load V.
[25%]

4. A cone shape water tank is full of water. The shell thickness of the tank is 6 mm. Determine the axial stress and the hoop stress of the shell in a point 300 mm below the water surface.
[25%]