o/c

Roll Number:

THAPAR UNIVERSITY, PATIALA

B.E.-Second Year, A Group — *UES010 – Solids and Structures*
MST- Sep 23, 2016 — *Name of Faculty: SHG/SHR/KKH/GUB/NG/APH/GB/RSC/DN*
Time: 2 Hours, Max Marks: 50

Note: ***Attempt all questions. Assume missing data suitably (if any).***
Attempt all parts of a question at one place.
Write your group number at top right corner of the answer sheet.
Write page number of each question at the front page of answer sheet.

Q.1 The rigid bar of negligible weight (Fig. 1) is pinned at *O* and attached to two vertical rods. Assuming that the rods were initially stress-free, what is the largest load **P**, that can be applied without exceeding stresses of 150 MPa in the steel rod and 70 MPa in the bronze rod? (12)

Q.2(a) The rigid bar in Fig. 2 is supported by axial bar *AB* and by a pin connection at *C*. Axial bar *AB* has a cross sectional area of A_1 = 275 mm^2, an elastic modulus of E = 200 GPa. The pin at *C* has a diameter of 25 mm. After load P=25 kN has been applied, Determine: (8)

(a) The magnitude axial stress in the bar *AB*

(b) The shear stress in the pin at *C*.

(b) The solid shaft as shown in Fig. 3 is made of steel. It has a uniform diameter of 40 mm and it runs at 600 rpm. A driving belt feeds 40 kW to pulley *A*, whereas 25 kW and 15 kW, respectively, are taken off from the other two pulleys, *B* and *C*. Find out the maximum shear stress induced in the shaft and total angle of twist. Take G = 80 GPa. (8)

Q.3 Obtain the expressions for shear force and bending moment for each segment of the beams shown in figure 4. Draw the SFD and BM diagrams indicating the values of the salient points. Also find the location of the point of contra-flexure, if any. (14)

Q.4 A composite bar made of steel and copper (Fig 5) is subjected to a temperature rise of 80°C. Determine the stresses developed in the two materials of the bar due to rise in temperature. (8)

Take E_{cu} = 105 GPa, E_{steel} = 210 GPa
α_{cu} = 18 x 10^{-6}/°C, α_{steel} = 11 x 10^{-6}/°C

P.T.O.

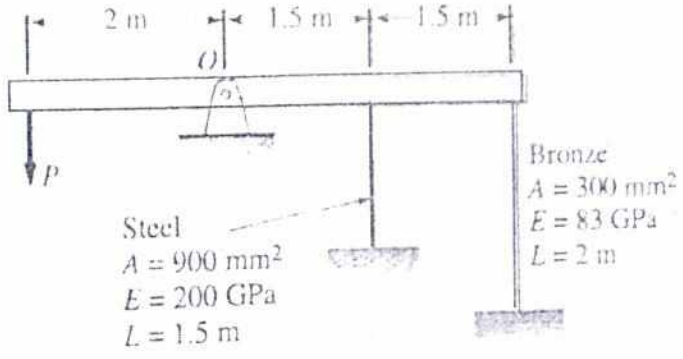

Fig. 1

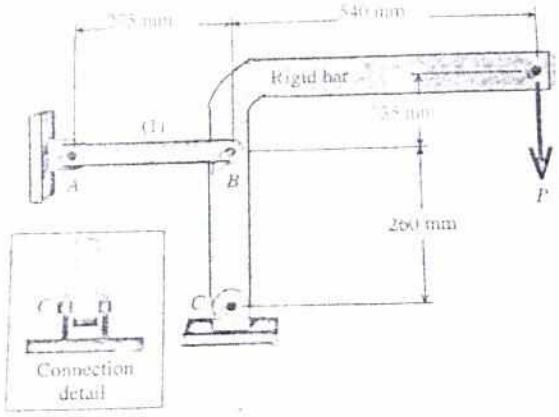

Fig. 2

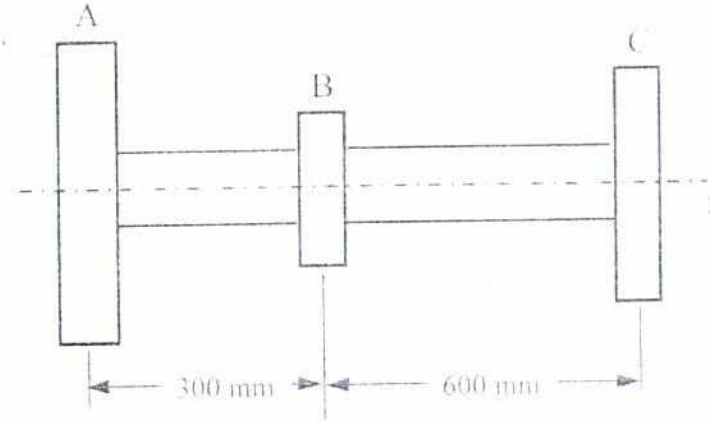

Fig. 3

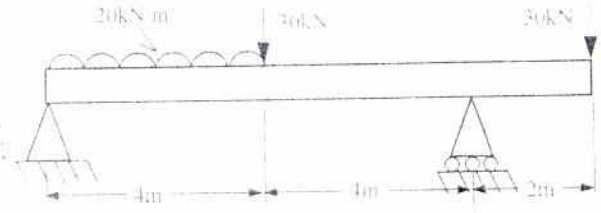

Fig. 4

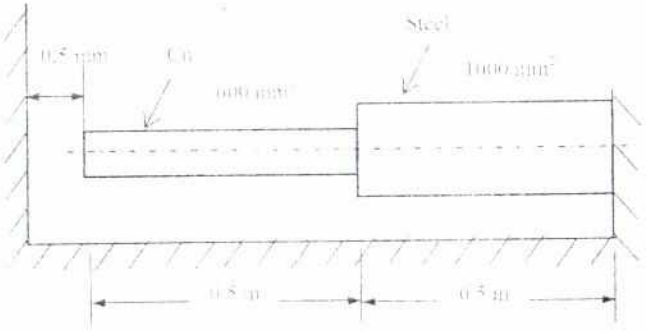

Fig. 5