Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 level 2nd Semester Examination – Dec./Jan. 2017
SCT 364-2 Strength of Materials

Uva Wellassa University

Instructions to candidates
Duration: 02 hours
Number of questions: 06
Mark allocation: 100

Answer four (04) questions only

1.

a. Determine the force in each member of the truss shown in Figure 1 (a). Indicate whether the members are in tension or compression. (15 marks)

b. Link *AB*, of width $b = 50$ mm and thickness $t = 6$ mm, is used to support the end of a horizontal beam. If the average normal stress in link AB is 140 MPa, and that the average shearing stress in each of the two pins is 80 MPa, determine,
   i. the diameter d of the pins (5 marks)
   ii. the average bearing stress in the link. (5 marks)

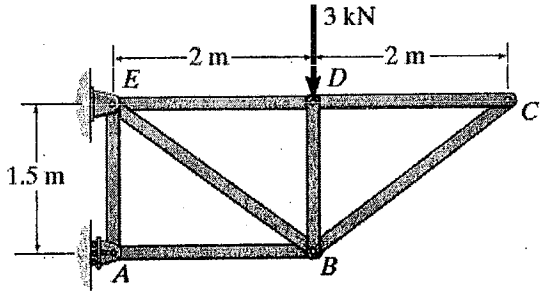

Figure 1(a)

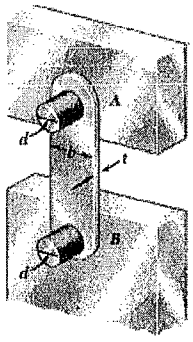

Figure 1(b)

2.

a. A shaft is made from a tube. The ratio of inside diameter to the outside diameter is 0.6. The material must not experience a shear stress greater than 500 kPa. The shaft must transmit 1.5 MW of mechanical power at 1500 rev/min. Calculate the shaft diameter. (11 marks)

(28)

b. A torque of magnitude $T = 1000$ Nm is applied at D as shown Figure 2 (b). If the diameter of shaft AB is 56 mm and that the diameter of shaft CD is 42 mm, determine the maximum shearing stress in

i. shaft AB, (7 marks)

ii. shaft CD. (7 marks)

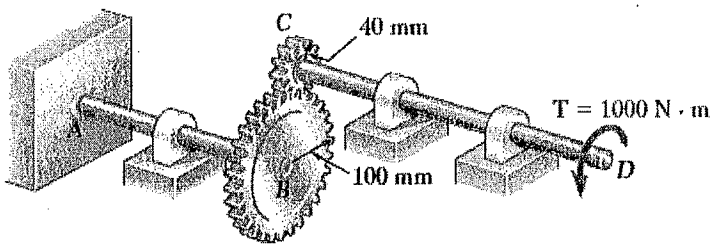

Figure 2 (b)

3.

a. Cross-section of a beam is shown in Figure 3 (a). Find,

i. location of the neutral axis for bending in longitudinal direction, (7 marks)

ii. second moment of area about the neutral axis. (8 marks)

b. A horizontal force P = 400 N is applied on the clamp as shown in Figure 3 (b). The cross section a-a is identical to the section shown in Figure 3(a). Determine the stresses at points A and B. (10 marks)

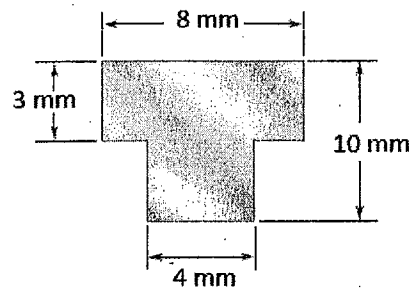

Figure 3(a)

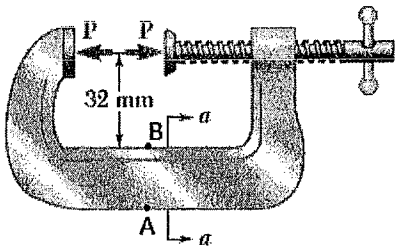

Figure 3(b)

4. Draw the shear and bending-moment diagrams for the rectangular beam and loading shown in Figure 4(a). Hence, determine the maximum normal stress due to bending on a transverse section at C. The cross-section of the beam is shown in Figure 4 (b). (25 marks)

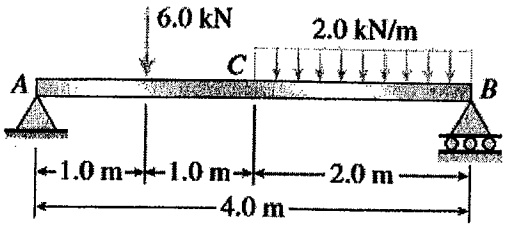

Figure 4(a)

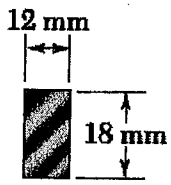

Figure 4(b)

5. Construct the Mohr's circle for the given state of stress shown in Figure 5. Hence determine,
   i. the principal stresses, (7 marks)
   ii. the principal planes, (6 marks)
   iii. maximum shear stress, (6 marks)
   iv. plane at which the maximum shear occurs. (6 marks)

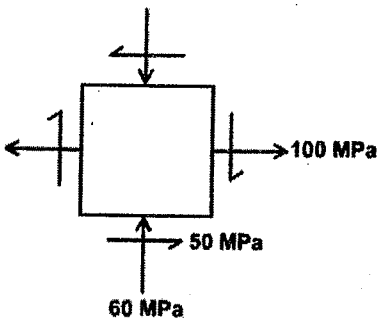

Figure 5

6. The cantilever beam AB shown in Figure 6 is of uniform cross section and carries a load P at its free end A. Determine the equation of the elastic curve and the deflection and slope at A. (25 marks)

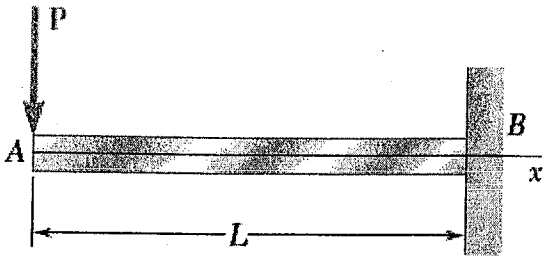

Figure 6