

Uva Wellassa University, Sri Lanka
End Semester Examination – March 2011
SCT 422-2 Engineering Design



Time: Two (02) Hours

Total 05 Questions
Answer all questions

1.
 - a. Select suitable materials for the following cases indicating the reason;
 - i. A shaft subjected to variable torsional and bending load
 - ii. Spring used in a spring loaded safety valve
 - iii. Nut of a heavy duty screw jack
 - iv. Low speed line shaft coupling

(40 marks)
 - b. Select suitable materials for the following parts stating the special property which makes it most suitable for use in manufacturing;
 - i. Turbine blade
 - ii. Bush bearing
 - iii. Dies
 - iv. Carburetor body
 - v. Keys (Used for fastening)
 - vi. Cams
 - vii. Heavy duty machine tool beds
 - viii. Ball bearing
 - ix. Automobile cylinder block
 - x. Helical springs

(60 marks)
2.
 - a. What do you mean by the factor of safety? List the important factors that influence the magnitude of the factor of safety.

(20 marks)
 - b. The piston rod of a steam engine is 50 mm in diameter and the length is 600 mm. The diameter of the piston is 400 mm and the maximum steam pressure is 0.9N/mm^2 . Find the compression (length reduction) of the piston rod if the Young's Modulus of the piston rod material is 210kN/mm^2 .

(80 marks)

3. The wing of a monoplane is approximated by a pin connected structure of beam AD and bar BC as depicted in Fig. Q03. Allowable axial stress of rod BC is 210MPa. Determine,
- Shear stress in the pin at hinge C.
 - The diameter of the rod BC.

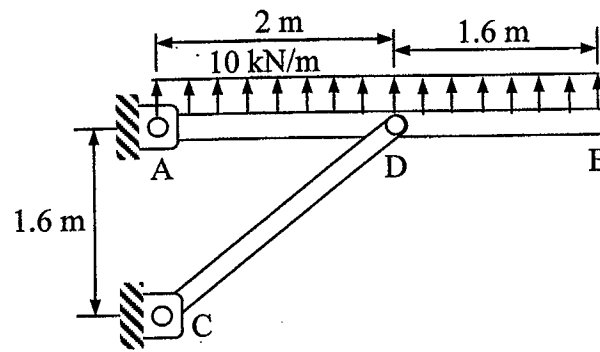


Fig. Q03

(100 marks)

4. Two bars of rectangular cross section (thickness $t = 15$ mm) are connected by a bolt in the manner shown in the Fig. Q04. The allowable shear stress in the bolt is 90 MPa and the allowable bearing stress between the bolt and the bars is 150 MPa. If the tensile load $P = 31$ kN, what is the minimum required diameter d_{\min} of the bolt?

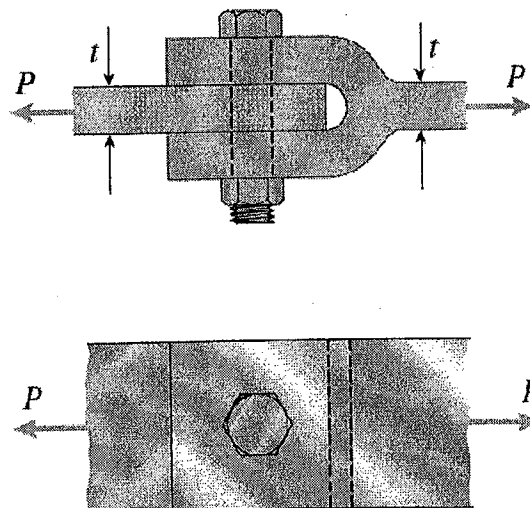


Fig. Q04

(100 marks)

5.

- a. Illustrate how the stress concentration in a component can be reduced. (20 marks)
- b. A bar of 12 mm diameter gets stretched by 3 mm under a steady load of 8 kN. What stress would be produced in the bar by a weight of 800 N, which falls through 80 mm before commencing the stretching of the rod, which is initially unstressed? Take $E = 200 \text{ kN/mm}^2$. (80 marks)