

COLLEGE OF ENGINEERING, PUNE

(An autonomous institute of Govt. of Maharashtra)

End Term Exam (Spring 2011-12)

Design of Machine Elements (ME-211)

Programme: - S.Y. B. TECH (Prod.)

Date: - 14/5/2012

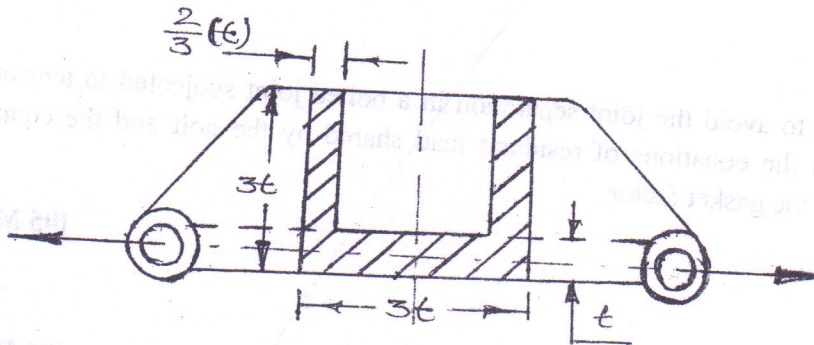
Duration: - Three Hours

Maximum Marks: - 50

- Instructions:
- 1) Solve any one question from Q.1) and Q.2)
 - 2) Figures to the right indicate full marks.
 - 3) Use of Non-Programmable calculator is allowed.
 - 4) Assume suitable data, if necessary.

- Q.1) A cast iron link as shown in figure is to carry a load of 2 tonnes. If the tensile stresses in the link are not to exceed 25 MPa, obtain the dimensions of the cross section of the link of its middle length.

[10 marks]



OR

- Q.2) Two rods of 50 mm diameter are to be joined by a cotter joint, with thickness of cotter as 12.5 mm. If the joint is to withstand an axial pull of 600 KN, find the various dimensions of the joint. The permissible stresses are: 300 N/mm² in tension, 220 N/mm² in shear and 450 N/mm² in crushing.

[10 Marks]

- Q.3) A shaft is supported by two bearings placed 1 meter apart. A 600 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 KN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is 180° and $\mu = 0.24$. Determine the suitable diameter for a solid shaft considering equivalent twisting and bending moment, allowing working stress of 63 N/mm² in tension and 42 N/mm² in shear for the shaft material. Assume that the torque on one pulley is equal to that on the other pulley. Use $T_1/T_2 = e^{\mu\theta}$

[10 Marks]

P.T.O

Q.4) A power screw of a sluice gate has double start square threads and 25 mm nominal diameter with 5 mm pitch. It is working under the total axial load of 10 kN including frictional resistance required to open and close the gate. The inner and outer diameter of the collar is 30 and 50 mm respectively. The coefficient of thread and collar friction are 0.2 and 0.15 respectively. The screw rotates at 10 rpm. Assuming uniform wear condition at the collar and allowable bearing pressure as 6 MPa find:

- i) Stresses in screw and nut.
- ii) Power required to rotate the screw
- iii) Height of the nut

[10 Marks]

Q.5) A nested spring comprising of two closed coil helical springs has equal length and is made up of same material. The springs are compressed to 15 mm by an axial load of 2.5 kN. If the spring index for both the springs is 5, find the load shared by each spring. Also determine the main dimensions of both the springs, if the permissible shear stress for spring material is not to exceed 240 MPa. Take modulus of rigidity as 8 GPa.

[10 Marks]

Q.6) Derive the condition to avoid the joint separation in a bolted joint subjected to tension and there by write down the equations of resultant load shared by the bolt and the connected members in terms of the gasket factor.

[05 Marks]

Q.7) Solve any two of the following

[05 Marks]

- 1) Explain nipping of spring. Specify its equation also.
- 2) Explain shot peening and specify the parameters which affect it.
- 3) Explain the effect of helix angle and coefficient of friction on the efficiency of power screw. Also state the factors on which coefficient of friction is dependent and independent.



All the Best

