

**III B.Tech I Semester Supplementary Examinations, May 2005****DESIGN OF MACHINE ELEMENTS****( Common to Mechanical Engineering and Production Engineering)****Time: 3 hours****Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) What are the properties to be considered in selecting the materials in the design of Machine Parts? Discuss.
- (b) In a hydro dynamic journal bearing, the bearing bush is fitted with a recommended class of fit 50H8-s6 in its housing. The limiting dimensions are as follows:

for bearing  $50^{+0.046}_{+0.000}$  and for Journal  $50^{-0.053}_{-0.072}$   
Find the type of Fit used and justify the answer.

2. (a) Briefly explain shear stress and shear strain?
- (b) Calculate the diameter of the solid shaft to transmit 50 kW at 180 rpm. If the angle of twist in a length of 4 meters is not to exceed  $0.4^\circ$ . The allowable stress in the material is 70 MPa and modulus of rigidity is 84 GPa.
3. (a) Explain the following methods of reducing stress concentration
  - i. Drilled holes
  - ii. Using large fillet radius
  - iii. Added grooves
- (b) A shaft is made of steel [ultimate tensile strength 700 MPa and yield point 420 MPa is subjected to a torque varying from 200N m] anti-clockwise to 600 N m clockwise. Calculate the diameter of the shaft if the factor of safety is 2 and it is based on the yield point and the endurance strength in shear.
4. (a) Explain the following terms in connection with riveted joints
  - i. Pitch
  - ii. Back pitch
  - iii. Diagonal pitch
  - iv. Margin
- (b) A double riveted butt joint, in which the pitch of the rivets in the outer rows is twice that in the inner rows, connects two 16 mm thick plates with two cover plates each 12 mm thick. The diameter of the rivets is 22 mm. Determine the pitches of the rivets in the two rows if the working stresses are not to exceed the following limits:  
Tensile stress in plates = 100 MPa, Shear stress in rivets = 75 MPa and bearing stresses in rivets and plates = 150 MPa.  
Make a fully dimensioned sketch of the joint showing atleast two views.

5. A 125 X 95 X 10 mm angle is welded to a frame by two 10 mm fillet welds, as shown in Figure 1. A load of 16 kN is applied normal to the gravity axis at a distance of 300 mm from the centre of gravity of welds. Find maximum shear stress in the welds, assuming each weld to be 100 mm long and parallel to the axis of the angle.

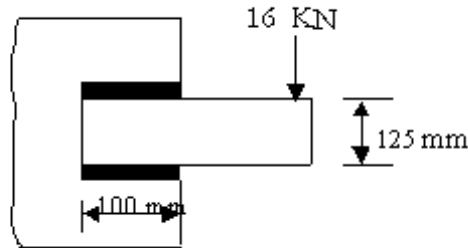


Figure 1:

6. (a) Discuss the effect of keys and key ways on the strength of the shaft.  
 (b) Design and draw a sleeve and cotter joint to connect two rods to transmit maximum tensile load of 82 kN. Assume sleeve cotter and rods are made of same material and design stresses in the material are 65 Mpa in tension; 130 in crushing and 50 Mpa in shear.
7. A hollow shaft of 0.5m outside diameter and 0.3m inside diameter is used to drive a propeller of a marine vessel. The shaft is mounted on bearings 6 meter apart and it transmits 5600 KW at 150 rpm. The maximum axial propeller thrust is 500 kN and the shaft weighs 70 kN determine the maximum shear stress developed in the shaft and the angular twist between the bearings.
8. Design and draw a muff coupling to transmit 50Hp at 120 rpm. The shaft and key are made of the same material having allowable shear stress of  $30 \text{ N/mm}^2$  and compressor stress of  $80 \text{ N/mm}^2$ . The flange is made, as cast Iron with allowable shear stress is  $15 \text{ N/mm}^2$ .

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