CODE NO: OR310355 OR

2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS
DESIGN OF MACHINE MEMBERS-I
(MECHANICAL ENGINEERING AND PRODUCTION ENGINEERING)

APRIL/MAY 2005

TIME – 3 HOUR
MARK – 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What are the properties to be considered in selecting the materials in thedesign 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. *[8+8]*

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 0.40. The allowable stress in the material is 70 MPa and modulus of rigidity is 84 GPa.

[8+8]

3. (a) Explain the following methods of reducing stress concentration

i. Using undercut shoulders

ii. Added grooves

(b) A round shaft made of cold finished AISI 1020 steel is subjected to a variable torque whose maximum value is 700 KN-m. For a factor of safety of 1.5 on the Soderberg criterion, determine the diameter of the shaft if

i. The torque is reversed

ii. The torque varies from zero to maximum

iii. The torque varies from 300 N m to a maximum. Assume, Correction factor for type of loading other than bending = 0.6
Size correction factor = 0.85
Surface correction factor = 0.87
Ultimate tensile strength =550 MPa.
Yield strength = 460 MPa

[6+10]

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4. (a) What is the difference between caulking and fullering? Explain with the help of neat sketches.

(b) A double riveted double cover butt joint in plates 20-mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are 120 MPa in tension, 100 MPa in shear and 150 MPa in crushing. Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear. *[8+8]*

5. (a) Show that the shear stress in case of an annular fillet weld subjected to torsion is given by = (2.83 T) / (∏ s d2)
where T = Torque on cylindrical element; s = weld size and d = Diameter of cylindrical element welded to the flat surface.

(b) A 50 mm diameter solid shaft of length 200 mm is welded at one end to a flat plate while the other end is subjected to a load of 10 KN acting vertically downwards. Determine the size of the weld, if the permissible shear stress in the weld is limited to 100 MPa.

[8+8]

6. (a) A feather key is 12mm wide and is to transmit 700N-m torque from a 400mm diameter shaft. The steel key has an allowable stress in tension and compression of 120Mpa and an allowable shear stress of 575Mpa. Determine the required length of key. If the key dimensions are reversed as 9mm wide and12mm deep, what would have been the required length of key for same load and material.

(b) Design a cotter joint to withstand an axial load varying from 45kN in tension to 45 kN in compression. The allowable for the steel used in the joint are 60Mpa in tension; 70 Mpa in crushing; 45 Mpa in shear.

[8+8]

7. An overhang hollow shaft carries a 900 mm diameter pulley, whose center is 250 mm from the center of the nearest bearing. The weight of the pulley is 600 N and the angle of lap is 1800. The pulley is driven by a motor vertically below it. If permissible tension in the belt is 2650 N and if the coefficient of friction between the belt and pulley surface is 0.3. Estimate the diameter of shaft, when the internal diameter is 0.6 of the external

.[16]

8. (a) Write a short note on universal coupling.

(b) Design a solid muff coupling made of cast iron to connect two shafts transmit- ting 35KW at 150rpm with a capability of 25% maximum torque greater than the mean torque. The shaft and key are made of mild steel for which per-missible shear and crushing stress are 30MN/m2 and 80MN/m2 respectiv

[6+10]

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