C 32011 (Pages : 2) Name.....

Reg.No.....

SIXTH SEMESTER B.Tech. (ENGINEERING) DEGREE EXAMINATION JUNE 2007

ME 04 602—MACHINE DESIGN

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Use of design Data book is permitted.
Any missing data may be assumed suitably by giving proper justification.

I. 1 Explain with sketch: Tolerance, Clearance, Interference and Clearance fit.

2 Show that stress in a rod subjected to sudden load will be twice that of gradually applied load.

3 List few detachable joints. What are its drawbacks?

4 What is the function of cover plate in a riveted joint for pressure vessel?

5 Give stress in a welded butter joint subjected to axial load.

6 List out functions of spring.

7 What is the advantage and limitations of hollow shaft over solid shaft?

8 What is equivalent Bending Moment and equivalent torque?

(8 x 5 = 40 marks)

II. A. The force action on a bolt consists of two components - an axial pull of 12 kN and a transverse shear force of 5 kN. The bolt is made of C 30 steel and factor of safety 2. Determine the required diameter of the bolt using various theories of failure (Take Poisson's ratio = 0.25).

Or

B. The stresses induced at a critical point in a machine component made of C45 steel are as follows: σ_x = 120 N/mm^2, σ_y = 50 N/mm^2. Calculate the factor of safety by (a) maximum normal stress theory (b) maximum shear stress theory (c) distortion energy theory.

III. A. A steam engine cylinder of 300 mm diameter is supplied with steam at 150 N/cm^2. The cover plate is fastened by 8 bolts of C 40 steel. For effective sealing, the minimum load on the joint is kept at 1.5 times the load due to gas pressure. Design suitable diameter of bolt taking into account the effect of fatigue. Assume stiffness of joint is too small when compared to that of the bolt.

Or

B. Design a single riveted lap joint for a girth seam of a pressure tank 1 m. diameter and subjected to a maximum pressure of 100 N/cm^2. Rivets are made of C 10 steel and plates of C 20 steel. A factor of safety of 2.5 may be employed on yield point.

IV. A. A 12.5 x 9.5 x 1 cm angle is joined to a frame by two parallel fillet welds along the edges of 15 cm leg. The angle is subjected to a tensile load on 180 kN. Find the lengths of the weld if the permissible static load per cm weld length is 4300 N.

Or

Turn over

B. Design a coil spring with a spring rate of 18 kN/m is compressed 25 mm, when the coil are closed. Take shear stress =350 MN/m^2 and spring index = 8. The ends are squared and ground. G = 83 GN/m^2.

V. A. A hollow shaft of 600 mm outside diameter and 400 mm inside diameter is used to drive propeller of a marine vessel. The shaft is supported on bearings 6 m apart and transmits 5000 kW at 150 r.p.m. Maximum axial propeller thrust is 500 kN. Shaft weight 75 kN. Determine the maximum shear stress developed and angular twist between bearings.

Or

B. The split muff coupling is to be designed to transmit 6.75 kW at 180 r.p.m. Determine the diameter of the solid shaft if the permissible shear stress in the shaft material is limited to 42 N/mm^2. Assuming that the two halves of the coupling are connected by 8 bolts, determine the diameter of each clamping bolt if the permissible tensile stress intensity for bolt material is limited to 70 N/mm^2. The coefficient of friction is 0.3.

(4 × 15 = 60 marks)