C 14742

(Pages : 3)

Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2010

ME 04 602—MACHINE DESIGN

Time : Three Hours

Maximum : 100 Marks

Answer all *the questions.*

I. (a) What are the principal causes of stress concentration ?

(b) What is meant by bilateral tolerance ?

(c) Explain the effect ofkeyway on the strength of a shaft.

(d) Describe the purpose of gib in cotter joint ? What are the applications of cotter joints ?

(e) Explain the different types of welded joints with neat sketch.

(f) Under what circumstances, concentric springs are preferred ?

(g) Explain power shafting.

(h) What are the different stresses acting in the couplings ?

[8 × 5 = 40 marks]

II. (a) Discuss the ISI coding of materials (with special reference to steels) on the basis of chemical composition and mechanical properties.

(b) Discuss maximum shear stress theory, its limitations and its advantages when compared to distortion energy theory.

(7 + 8 = 15 marks)

Or

(c) A machine part of 16 mm diameter is made of Alloy Steel. It is subjected to a bending moment of 100 Nm, a torque of 50 Nm and an axial pull of 5kN. Estimate the factor of safety based on Max. Normal Stress, Max. Shear Stress and Max. Distortion Energy theories. Assume yield tensile strength for the material as 500 Mpa.

(15 marks)

III. (a) A shaft and a key are made of the same material and the key width is ¼ of the shaft diameter. Consider shear only, determine the minimum length of the key in terms of the shaft diameter. The shearing strength of the key material is 60% of its crushing strength. Determine the thickness of the key to make the key equally strong in shear and crushing.

(15 marks)

Or

Turn over

(b) (i) What do you mean by efficiency of riveted joint?

(ii) 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.

(4 + 11= 15 marks)

IV. (a) Sketch and discuss the various types of welded joints used in pressure vessels.

(b) A bracket carrying a load of 15 kN is to be welded as shown in Figure 1. Find the size of weld required if the allowable shear stress is not to exceed 80 MPa.

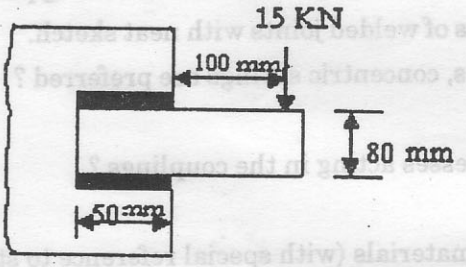

Figure 1

(5 + 10 marks)

Or

(c) A rail carriage weighing 200kN and running at 5 km/hour is brought to rest by four buffer springs of close coiled helical type during connection with another carriage which is already at rest. The mean coil diameter is 5 times the wire diameter. The deflection of each spring is 220 mm, to bring the carriage to rest. Safe shear stress for the spring material is 400 N/mm^2. Calculate the maximum load on the spring, diameter of wire and coil, number of turns and free length of spring. Assume the ends of spring are squared and ground. Take G = 0.8×10^4 N/mm^2.

(15 marks)

V. (a) A shaft running at 400 rpm transmits 10 kW. Assuming allowable shear stress in shaft is 40 Mpa, find the diameter of the shaft.

(b) Determine the diameter of the hollow shaft with inside dia = 0.6 outside dia. The shaft is driven by an overhung pulley of 90 cm dia. Take weight of pulley = 60kg, the belt tensions as 290 and 100kg, over hang = 25 cm, angle of lap = 180°.

(6 + 9 = 15 marks)

Or

(c) The shaft and the flange of a marine engine are to be designed for flange coupling, in which the flange is forged on the end of the shaft. The following particulars are considered in the design.

Power of the engine = 3 MW, Speed of the engine =100 rpm.

Permissible shear stress in bolts and shaft = 60 Mpa

Number of bolts used = 8

Pitch circle diameter of bolts = 1.6 × diameter of shaft. Find (i) Diameter of shaft (ii) Diameter of bolts (iii) Thickness of flange (iv) diameter of flange.

(15 marks)

[4 × 15 = 60 marks]