C 47634 (Pages 2) Name..... Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION JUNE 2008

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 State the use of preferred numbers.

2 What will happen if deformation takes place in gear profiles due to excessive contact stress?

3 Give specifications of parallel key.

4 Under what circumstances, hollow riveted joints are used?

5 What are the advantages of welded joint over riveted joints?

6 Why leaf springs are made in layers instead of a single plate?

7 Differentiate between shaft and axle.

8 Sketch a flange coupling and mark its major dimensions.

(8 × 5 = 40 marks)

II. (a) A steel member is subjected to 3-dimensional stress system and the resulting principal stresses are 120 N/mm^2 tension, 80 N/mm^2 and 40 N/mm^2 compression. If the proportional limit of the material in simple tension is 280 N/mm^2 and its Poisson ratio is 0.3; Determine factor of safety according to (a) maximum principal stress theory; (b) maximum principal strain theory ;(c) maximum shear stress theory.

Or

(b) The resulting principal stresses on a C 15 steel member when subjected to a 3-dimensional stress system are 100 N/mm^2 in tension 60 N/mm^2 and 20 N/mm^2 in compression. Determine the factor of safety according to

(a) maximum principal stress theory.

(b) Maximum shear stress theory.

Assume proportional stress limit of the material in tension and Poisson's ratio.

III. (a) Design a cotter joint to transmit an axial force of 120 kN. Material to be used is C 40. A factor of safety of 2 may be taken at yield point.

Or

Turn over

(b) Design and prepare working drawings of triple riveted butt joint suitable for longitudinal seam and a double riveted lap joint for the circumferential seam of Lancashire boiler of 2.5 m diameter. Maximum working pressure is 100 N/cm^2. Working stresses are 90 N/mm^2 for plates in tension, 70 N/mm^2 for rivets in shear, 120 N/mm^2 for rivets / plates in crushing. Indicate how you will make joints seam tight after riveting.

IV. (a) A 65 mm diameter solid shaft is to be welded to a flat plate by a fillet weld around the circumference of the shaft. Determine the size of the weld if the torque on the shaft is 3 kN-m. The allowable shear stress in the weld is 70 N/mm^2.

Or

(b) Design a close coiled helical compression spring for a service load ranging from 3000 N to 4000 N. The axial deflection of the spring for the load range is 10mm. Take spring index as 6. Permissible shear stress is 42 kN/m^2 and $G = 0.84 \times 10^7$ N/cm^2. Draw a fully dimensioned sketch.

V. (a) A hollow shaft is used to transmit 15 kW at 250 r.p.m. The loading is such that the maximum bending moment is 150 kN-cm, maximum Torsional moment is 50 kN-cm and the axial compressive load is 20 kN. The shaft is supported on rigid bearings 150 cm apart and is subjected to minor shock load. The maximum allowable stress = 2 kN/cm^2. The inside diameter is 0.75 times the outside diameter. Calculate the diameter of the shaft.

Or

(b) A bushed pin type flexible coupling (flange coupling) is required to transmit 10 kW at 1440 r.p.m. of the shaft speed. The diameters of the shafts to be connected are 40 mm. Select suitable dimensions of the coupling and check for the safety. Shafts are made of C15 steel.

$(4 \times 15 = 60$ marks)