B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Automobile Engineering

AU 010 701/ME 010 701—DESIGN OF MACHINE ELEMENTS (AU, ME)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours   Maximum : 100 Marks

Use of approved design data book is permitted.
Any missed data may be suitably assumed.
Answer **all** *questions.*
Each question carries 25 marks.

1. Explain the Maximum shear stress theory, Maximum normal stress theory and Distortion energy theory of failure.

Or

2. (a) Discuss the various factors which govern the selection of materials for a machine component.

   (b) Explain the weighted point method for material selection and state its limitations.

3. What are the different forms threads used for the power screws ?

   A double threaded power screw, used for lifting the load, has a nominal diameter of 30mm and a pitch of 6mm. The coefficient of friction at the screw threads is 0.1. Neglecting collar friction, calculate :

   (a) Efficiency of the screw with square threads and

   (b) Efficiency with Acme threads ($2\theta = 29°$).

Or

4. Distinguish between Differential and compound screw.

   A 50kN capacity screw jack consists of a square threaded steel screw meshing with a bronze nut. The nominal diameter is 60mm and the pitch is 9mm. The permissible bearing pressure at the threads is Is = 30 N/mm^2. Calculate :
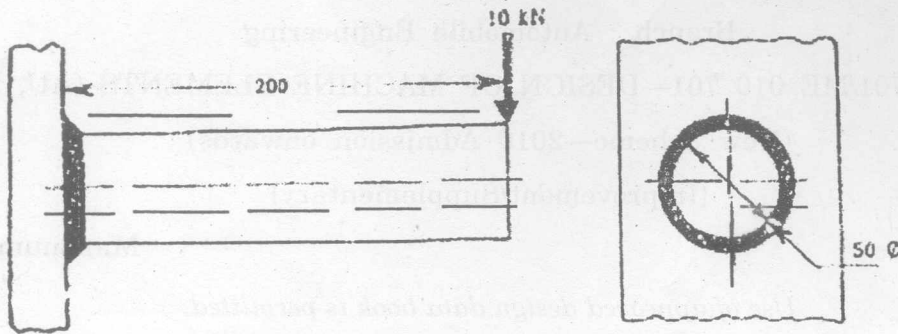
   (a) The length of the nut.

   (b) The transverse shear stress in the nut.
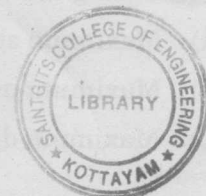
5. What are the different types of welded joints ?

A circular shaft, 50mm in diameter is welded to a support by means of a fillet weld as shown in the figure. Determine the size of the weld if the permissible shear stress in the weld is limited to 100 N/m^2 :

Or

6. An automotive single plate clutch, with two pairs of friction surfaces transmits a 300 N-m torque at 1500 r.p.m. The inner and outer diameters of the friction disc are 170 and 27 mm respectively. The coefficient of friction is 0.35. The normal force on the friction surface is exerted by nine helical compression springs, so that the clutch is always engaged. The clutch is disengaged when the external force further compresses the spring. The spring index is 5 and the number of active coils is 6. The springs are made of patented and cold-drawn steel wires of grade 2. (G = 81370 N/mm^2). The permissible shear stress for the spring wire is 305 of the ultimate tensile strength. Design the springs and specify their dimensions.

7. A steel shaft is subjected to a bending moment of 9kNm and a twisting moment of 12kNm. The yield strength of steel is 360MPa in tension and compression and the Poisson's ratio is 0.3. If a factor safety of 2 with respect to failure is specified, determine the permissible diameter of the shaft according to :

    (a) Maximum shear stress theory of failure.

    (b) Maximum normal stress theory of failure.

    (c) Maximum distortion theory of failure.

Or

8. Design a bushed pin type of flexible coupling to connect a pump shaft to a motor shaft transmitting 30 kW at 900 r.p.m. The overall torque is 15% more than mean torque. The material allowable properties are as follows :

σ (in crushing for shaft and key material) = 80 MPa

T (In shear for shaft and key material) = 40 MPa

T (In shear for cast iron) = 15 MPa

Material of the pin is as same as that of shaft and key. Draw the sketch of the coupling.

(4 × 25 = 100 marks)