

G 701

(Pages : 3)

Reg. No.....

Name.....



**B.TECH. DEGREE EXAMINATION, MAY 2014**

**Seventh Semester**

Branch : Automobile Engineering

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

(Improvement/Supplementary)

[2010 Admissions]

Time : Three Hours

Maximum : 100 Marks

*Use of approved design data book is permitted.*

*Any missed data may suitably be assumed.*

*Answer all question.*

*Each question carries 25 marks.*

1. Explain the term "Design Synthesis." Briefly explain various steps involved in the mechanical engineering design process.

Or

2. Write a brief note about the type of fits and tolerances. Discuss about the guidelines for selection of fits.

3. Explain the guidelines for the selection of proper thread profile for the power screws. A double threaded power screw, with ISO metric trapezoidal threads, is used to raise a load of 30kN. The nominal diameter is 100 mm and the pitch is 12 mm. The coefficient of friction at screw threads is 0.15. Neglecting collar friction, calculate :

- (a) Torque required to raise the load.
- (b) Torque required to lower the load.
- (c) Efficiency of the screw.

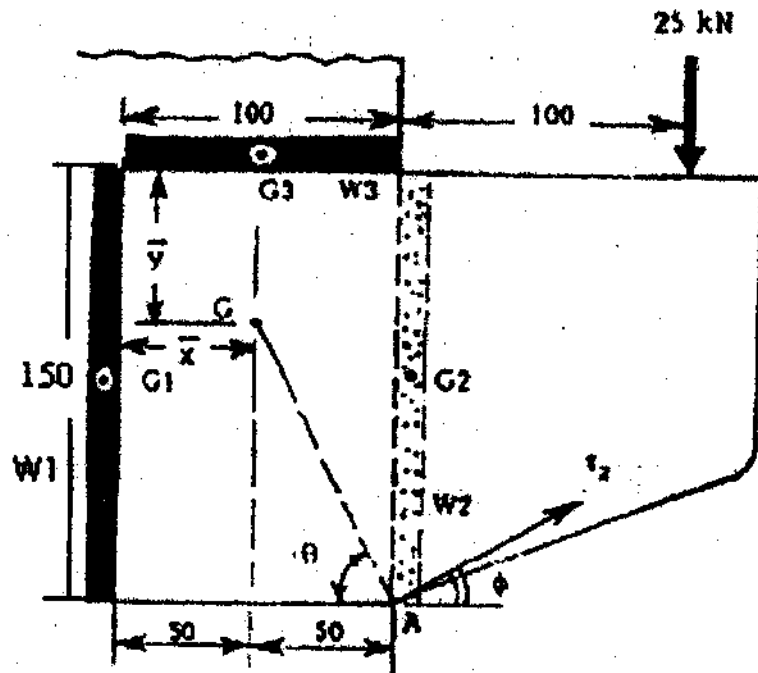
Or

4. A bolted assembly is subjected to an external force, which varies from 0 to 10 kN. The combined stiffness of the parts, held together by the bolt is three times the stiffness of the bolt. The bolt is initially so tightened that at 50% overload condition, the parts held together by the bolt are just about to separate. The bolt is machined from plane carbon steel 50C4 ( $S_{ut} = 660 \text{ N/mm}^2$  and  $S_{yt} = 460 \text{ N/mm}^2$ ). The fatigue stress concentration factor is 2.5 and the expected reliability is 95%. The factor of safety is 2. Determine the size of the bolt with coarse threads.

Turn over

5. Illustrate the important welding symbols used on the drawings.

An eccentrically loaded bracket is welded to the support as shown in figure. The permissible shear stress for the weld material is  $55 \text{ N/mm}^2$  and the load is static. Determine the throat and leg dimensions for the weld.



Or

6. A direct reading tension spring balance consists of a helical tension spring, which is attached to a rigid support at one end and carries masses at the other free end. The pointer attached to the free end moves on a scale and indicates the mass. The length of the scale is 100 mm, which is divided into 50 equal divisions. Each division on the scale indicates 0.5 kg. The maximum capacity of the spring balance is 25 kg. The spring index is 6. The spring is made of an oil hardened and tempered steel wire of SW-grade ( $G = 81370 \text{ N/mm}^2$ ). The permissible shear stress in the spring wire should be 50% of the ultimate tensile strength. Design the spring and give its specifications.

7. A horizontal nickel steel shaft rests on two bearings, A at the left and B at the right end and carries two gears C and D located at distances of 250 mm and 400 mm respectively from the centre line of the left and right bearings. The pitch diameter of the gear C is 600 mm and that of D is 200 mm. The distance between the centre line of the bearings is 2400 mm. The shaft transmits 20kW at 120 r.p.m. The power is delivered to the shaft at gear C and is taken out at gear D in such a manner that the tooth pressure  $F_{tc}$  of the gear C and  $F_{td}$  of the gear D act vertically downwards. Find the diameter of the shaft, if the working stress is 100 MPa in tension and 56 MPa in shear. The gear C and D weighs 950N and 350N respectively. The combined shock and fatigue factors for bending and torsion may be taken as 1.5 and 1.2, respectively.

Or

8. Design a bushed pin type flexible coupling to connect a motor shaft to a pump shaft transmitting 20kW power at 1440 r.p.m. The allowable shear and crushing stress for steel shafts, keys and pins are 40 MPa and 80 MPa respectively. The allowable shear stress for the cast iron flange is 10 MPa and the allowable bearing pressure for rubber bush is 0.5 MPa.

(4 × 25 = 100 marks)

