6E3049

B.Tech. VIth Semester (Main/Back) Examination, June - 2010
Mechanical Engineering
6ME1 Design of M/c Elements-II (Common for Mech., & P.I)

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Instructions to Candidates:

Attempt any five questions selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1.   Design Data Handbook.

Unit - I

1.   a)   Discuss influence of size, surface finish and reliability in modifying the Endurance limit.

(6)

   b)   A simply supported shaft of C 40 steel and 1000 mm span carries a central load of 800 kg at the centre of span. The torque varies from 1000 N - m to 2000 N - m. Ignoring stress concentration, determine diameter of shaft using maximum shear stress theory. Take $F.O.S=2$.

(10)

OR

   a)   Discuss methods of mitigation of stress concentration.

(6)

   b)   For a rectangular plate of section 70 mm × 10 mm with a central hole of 5mm, find the value of completely reversed axial load that can be applied for infinite life and 95% reliability. The plate is machined out of C15 steel. Consider the effect of stress concentration and take notch sensitivity as 0.8 and $F.O.S=2$.

(10)

All dimensions are in mm
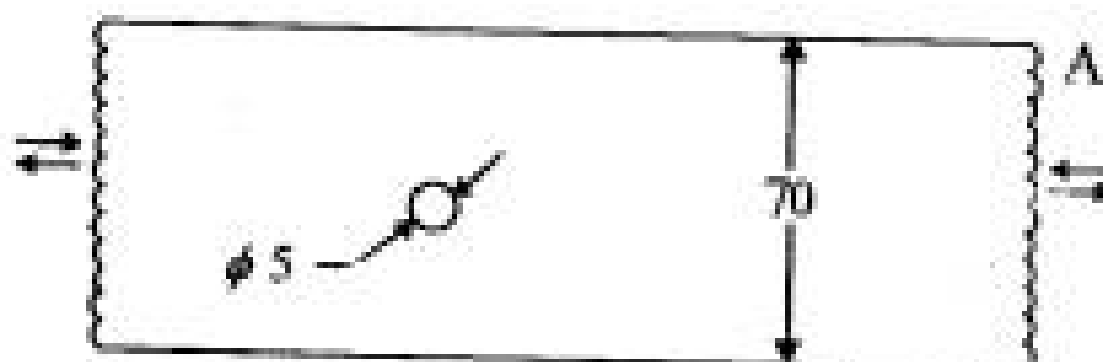
2. a) Discuss preloading of bolts. Further discuss stresses in bolt due to preloading.
   (6)

   b) Determine maximum value of stress in a C-Clamp as shown below. (10)

All dimensions are in mm

Cross section
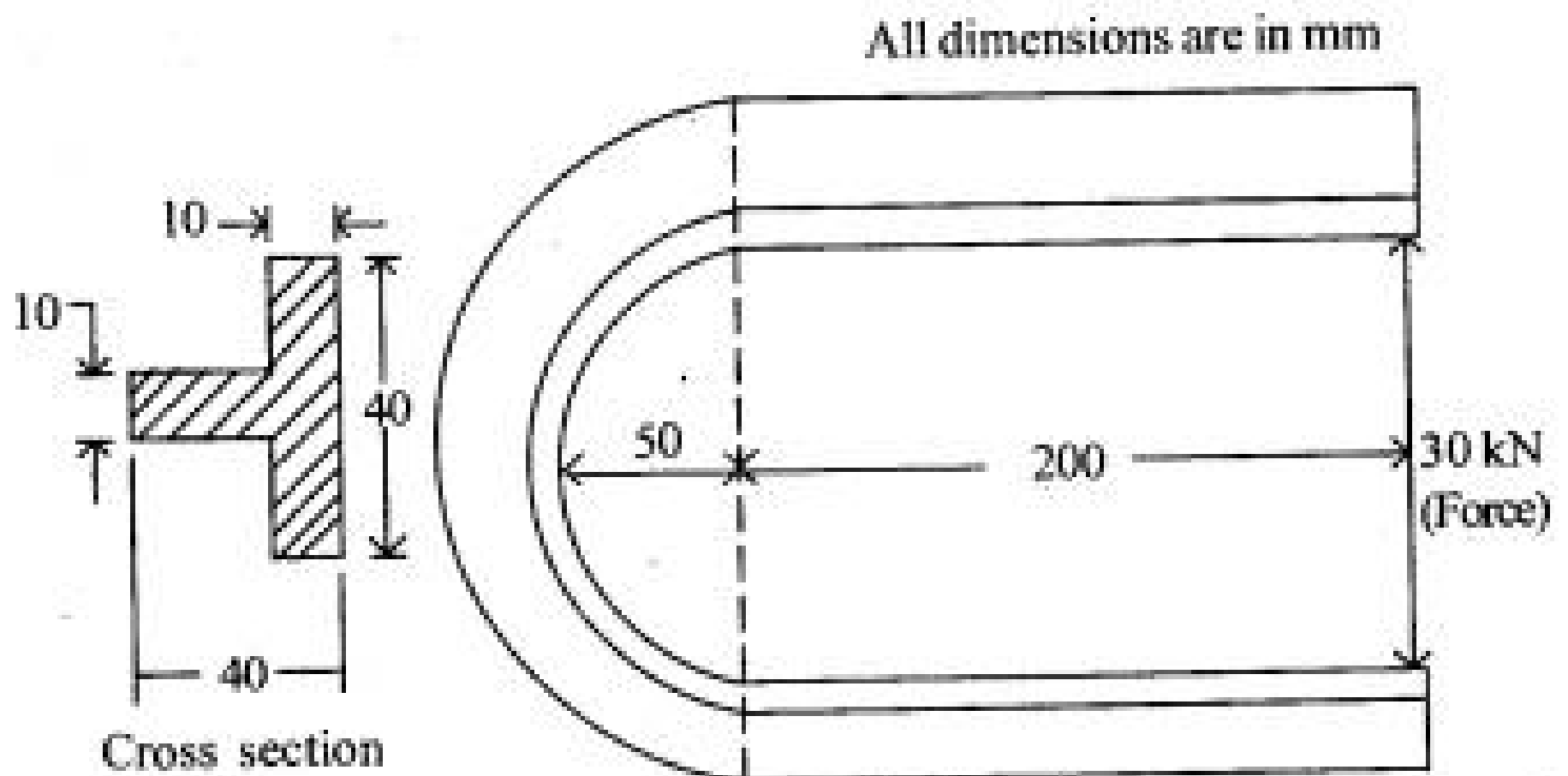
OR

a) Draw and describe various thread forms suitable for power screws. (6)

b) Design a screw jack to lift 2.5 tonnes by 20 cm. Take C 25 carbon steel for screw, nut and lever. Coefficient of friction for collar and threads is 0.2 Make suitable assumptions wherever needed. (10)

Unit - III

3. a) Draw and describe Chordal action in Chain drive. (6)

   b) Determine width of belt and belt length for the following particulars of a flat belt drive : (10)

   Centre distance = 6000 mm, Power = 100 KW.

   Pulley diameters = 420 mm and 1680 mm.

   Speed of bigger pulley = 240 rpm

   Belt thickness = 8 mm of leather

   Coefficient of friction $\mu = 0.3$

   Material density $e = 0.92 gm/cm^3$

   Allowable stress in belt = 2.0 N/mm^2.

OR

a) Discuss stresses in a helical spring subjected to axial load. (6)

b) A helical compression spring is made from a wire of 1 mm diameter having yield strength of 720 N/mm². It has mean diameter of 12 mm and there are 14 active coils of spring. Find :

   i) Static load corresponding to yield point

   ii) Deflection

   iii) Stiffness

   iv) Solid height and

   v) free length,

   Take $G = 0.84 \times 10^5$ N/mm² Mention end conditions. (10)

Unit - IV

4. a) List out the assumptions made in Lewis equation for gear design. (6)

   b) Design a 20° spur gear drive to transmit 10 kW from a shaft running at 1440 r.p.m. to another shaft running at 360 r.p.m. Use C 45 for gear and pinion with suitable FOS. (10)

OR

a) Discuss gear materials and their application. (6)

b) A helical pair transmits 20 KW with pinion of 20 teeth and 5 module running at 1200 r.p.m. Pressure angle is 20° and helix angle is 25°. Compute

   i) The tangential force

   ii) The radial force and

   iii) The axial thrust

   Assume suitable positions of gear and pinion and direction of rotation. Accordingly draw a force component diagram. (10)

Unit - V

5. a) Discuss bearing characteristic number. With help of diagram discuss different states of hydrodynamic lubrication. (6)

   b) Design a journal bearing for supporting a generator shaft of 75 mm dia with a load of 12 KN running at 1440 r.p.m. Suitable data may be picked from design hand book. (10)

OR

   a) Discuss the types of antifriction bearings and their application. (5)

   b) Draw and discuss pressure distribution diagrams for a hydrodynamic journal bearing. (5)

   c) Select a suitable anti friction bearing for a radial load of 2000 N with operation at 1200 r.p.m. for 2200 hours. Assume the axial load, if any, to be negligible.(6)