

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-III Examination May 2012

Subject code: 131902

Subject Name: Machine Design & Industrial Drafting

Date: 09/05/2012

Time: 02.30 pm – 05.30 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) (i) Write design procedure for designing a machine element. **04**
(ii) Define limits, fits, and tolerance. **03**
- (b) Design a knuckle joint to connect two circular mild steel rods which are subjected to a tensile load of 63 kN. The allowable stresses are 80 MPa in tension, 56 MPa in shear and 80 MPa in crushing. **07**
- Q.2** (a) (i) What is stress concentration? Suggest the different methods for reducing the stress concentration with the help of sketches. **04**
(ii) What is factor of safety? Write different factors affecting the selection of factor of safety. **03**
- (b) A bracket is subjected to a load of 32 kN which is joined to a structure by means of 8 numbers of rivets as shown in Fig. 1. Find the size of the rivets if the permissible shear stress is 80 MPa. **07**

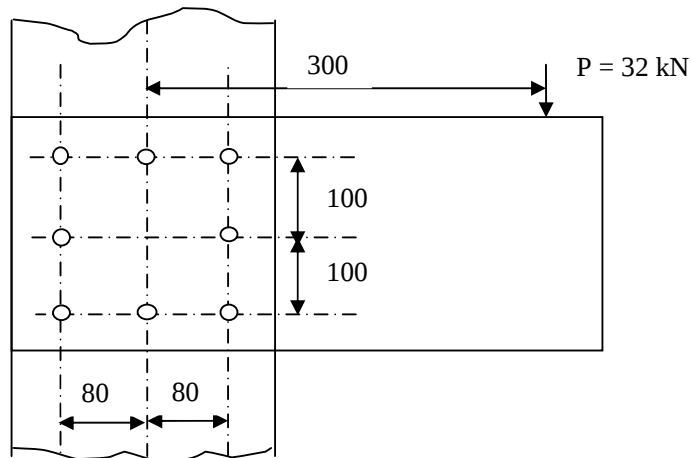


Fig. 1; Q. 2 (b)

OR

- (b) Write design procedure for design of a socket and spigot joint, which may be subjected to an axial load. Write the design equations for different failure criteria. Draw sketches for the same. **07**

- Q.3 (a)** A mild steel link is as shown in Fig. 2, which is subjected to a tensile load of 80 kN. Find the b. The permissible tensile stress is 70 MPa. **07**

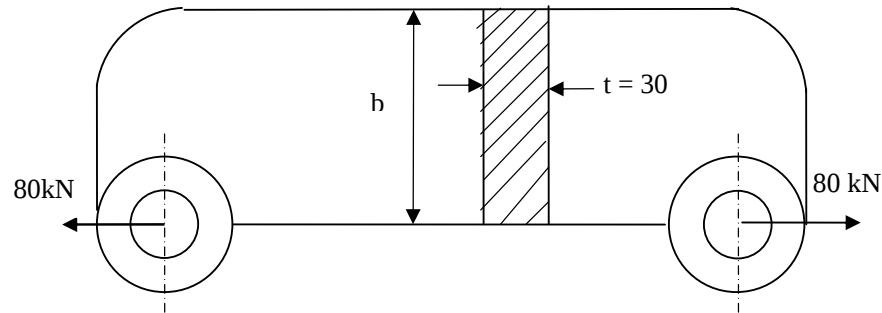


Fig. 2; Q. 3 (a)

- (b)** A bracket is fillet welded to a structure as shown in Fig. 3, which is subjected to a load of 50 kN. Find the size of weld required if allowable shear stress is not to exceed 75 MPa. **07**

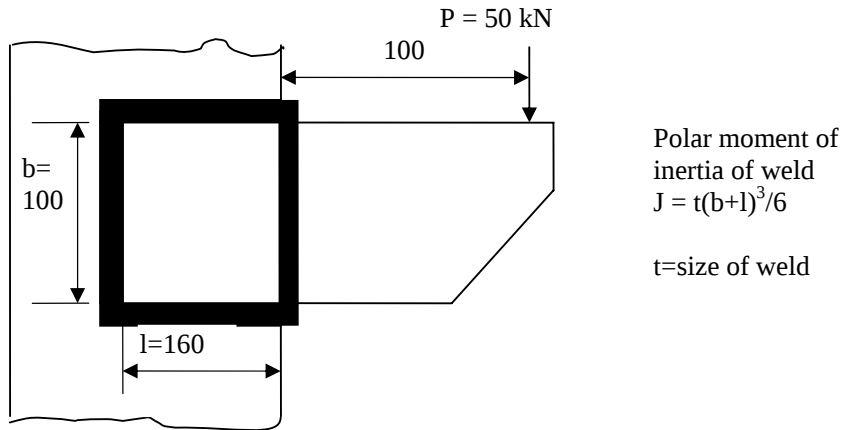


Fig. 3 : Q. 3 (b)

OR

- Q.3 (a)** Design and draw a turnbuckle for a capacity of 40 kN, which is used for adjusting tension in a v-belt drive of a machine tool. The permissible stresses for rods and nut are 80 MPa in tension, 50 MPa in shear and 80 MPa in crushing. **07**
- (b)** The lead screw of a lathe machine has single start trapezoidal threads of 52 mm nominal diameter and 8 mm pitch. The screw is required to exert an axial force of 2 kN in order to drive the tool carriage, during turning operation. The thrust is carried on a collar of 100 mm outer diameter and 60 mm inner diameter. The values of co-efficient of friction at the screw threads and the collar are 0.15 and 0.12 respectively. The lead screw rotates at 30 rpm. Calculate **07**
- (i) The power required to drive the lead screw.
 - (ii) The efficiency of the screw.

- Q.4 (a)** The lever of a lever loaded safety valve shown in Fig. 4. The diameter of the valve is 80 mm and valve has to blow off at a pressure of 1.25 MPa. The permissible stress in tension, shear and crushing are 70 MPa, 20 MPa and 50 MPa respectively. The permissible bearing pressure for the pin may be taken as 20 MPa. Design the pins and the lever; assume rectangular cross section of the lever with height equal to three times the thickness. **07**

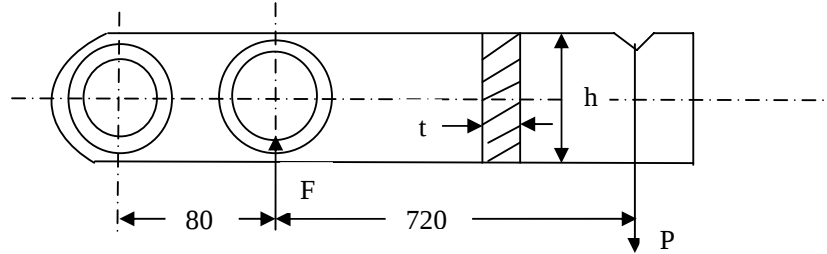


Fig. 4; Q. 4(a)

- (b)** Draw a neat sketch of a protected type flanged coupling and write the design procedure with the design equations for different failure criteria. **07**

OR

- Q.4 (a)** A 600 mm diameter pulley transmits 16 kW power at a speed of 400 rpm. Pulley is cantilever at a distance of 200 mm from the nearest bearing. The weight of the pulley is 1500 N. It is driven by a horizontal belt drive. The co-efficient of friction between belt and pulley is 0.3 and the angle of lap 180° . Take the fatigue and shock factors as $K_b = 2.0$ and $K_s = 1.5$. Determine the shaft diameter. **07**
- (b)** Explain different types of keys with its applications. **07**

- Q.5 (a)** Design a cast iron split muff coupling to transmit a power of 10 kW at 250 rpm. Consider an overload of 25%. The allowable shear stress in the shaft and key is 36 MPa and for the muff 16 MPa. Take the co-efficient of friction 0.3 and the tensile strength of the high tensile bolts 150 MPa. **07**
- (b)** (i) Discuss the different types of failure in riveted joint. **04**
(ii) What is self locking and overhauling power screw? What is significance of these properties? **03**

OR

- Q.5 (a)** Explain circle, rectangle, polygon, scale, array, mirror and trim commands of AutoCAD. **07**
- (b)** (i) Draw the generalized surface roughness symbol showing position of all information on it. **04**
(ii) Explain the machining symbol with all parameter. **03**
