Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (New) EXAMINATION – WINTER 2015

Subject Code:2142506 **Date:01/01/2016**

Subject Name: Fundamentals of Machine Design

Time: 2:30pm to 5:00pm **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)** Give classification of machine design. **07**

(b) Explain following terms. **07**

i) Factor of safety. ii) Compressive stress and strain. iii) Bending stress.

Q.2 **(a)** Explain common types of screw fastenings. **07**

(b) Find the efficiency of the following riveted joints: **07**

1. Single riveted lap joint of 6mm plates with 20mm diameter rivets having pitch of 50mm.
2. Double riveted lap joint of 6mm plates with 20mm diameter rivets having pitch of 65mm.

Assume, Permissible tensile stress in plate = 120Mpa.
Permissible Shearing stress in rivets = 90Mpa.
Permissible Crushing stress in rivets = 180Mpa.

OR

(b) A bracket is riveted to a column by 6 rivets of equal size as shown in figure 2(b). It carries a load of 60kN at a distance of 200mm from the center of the column. If the maximum shear stress in the rivet is limited to 150Mpa, determine the diameter of the rivet. **07**

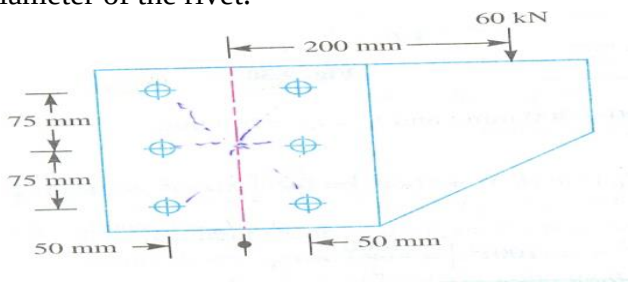

Figure 2(b)

Q.3 **(a)** List out special cases of fillet welded joint and explain it. **07**

(b) Design a knuckle joint to transmit 150kN. The design stresses may be taken as 75Mpa in tension, 60Mpa in shear and 150Mpa in compression. **07**

OR

Q.3 **(a)** Give the design procedure of knuckle joint. **07**

(b) A 50mm diameter solid shaft is welded to a flat plate as shown in figure 3(b).if the size of the weld is 15mm, find the maximum normal and shear stress in the weld. **07**

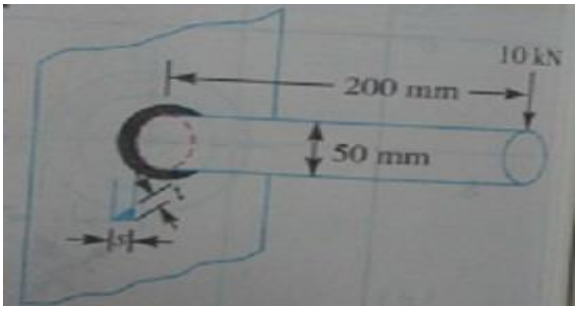

Figure 3(b)

Q.4 **(a)** Explain different types of end condition of Euler's column theory and also list out assumptions of theory. **07**

(b) A solid circular shaft is subjected to a bending moment of 3000 N-m and a torque of 10,000 N-m. The shaft is made of 45 C 8 Steel having ultimate tensile stress of 700Mpa and a ultimate shear stress of 500Mpa. Assume factor of safety as 6, Determine the diameter of the shaft. **07**

OR

Q.4 **(a)** Give the design procedure when shaft subjected to combined twisting moment and bending moment. **07**

(b) The maximum load on petrol engine push road 300mm long is 1400 N. It is hollow having the outer diameter 1.25 times the inner diameter. Spherical seated bearings are used for the push road. The modulus of elasticity of the material of the push road is 210kN/mm^2.find suitable size for the push road. taking a factor of safety of 2.5 **07**

Q.5 **(a)** Define surface roughness and explain different types of surface irregularities. **07**

(b) Design a right angle bell crank lever. The horizontal arm is 500mm long and a load of 4.5kN acts vertically downward through a pin in the forked end of this arm. At the end of the 150mm long arm which is perpendicular to the 500mm long arm, a force P act at right angles to the axis of 150mm arm through a pin in to a forked. The lever consists of forged steel material and a pin at fulcrum. Take the following data for both the pins and lever material: **07**

Safe stress in tension= 75Mpa, Safe stress in shear = 60Mpa, safe bearing pressure on pins = 10N/mm^2. Refer figure 5(b)

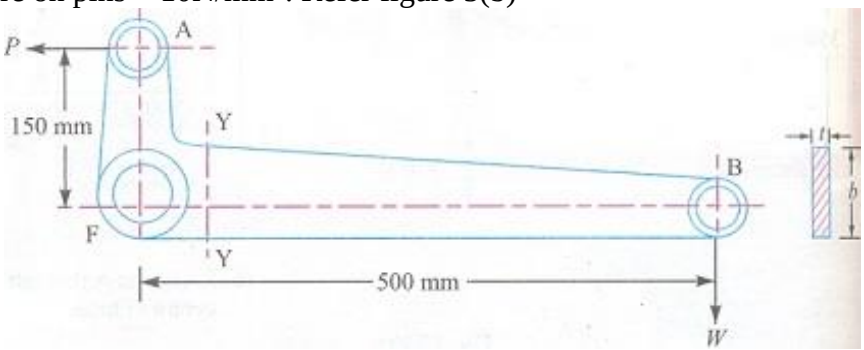

Figure5(b)

OR

Q.5 **(a)** Explain usual procedure adopted for design lever. **07**

(b) Explain different elements of production engineering drawing. **07**

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