

- b. A bracket is bolted to a vertical support by seven bolts of equal size as shown in Fig.Q4(b). Determine the size of the bolt, if the allowable shear stress in the bolt material is 40 MPa.

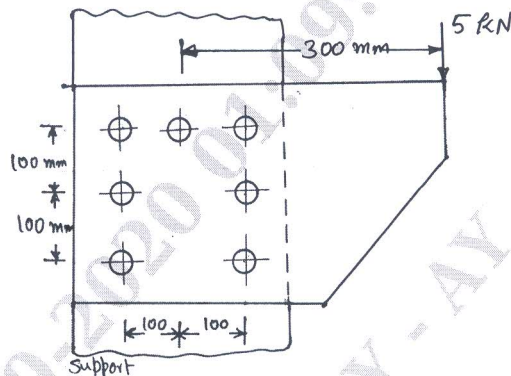


Fig.Q4(b)

(12 Marks)

PART - B

- 5 A commercial steel shaft is supported on bearings 1m between centers. A cast iron pulley of 0.6m diameter weighing 1 kN is located 0.3m to the right of the right hand bearing and receives 25 kW power at 1000 rpm from a motor pulley by horizontal belt drive directly behind it. The ratio of belt tensions is 3. A 20° spur pinion of pitch circle diameter 0.2m weighing 200 N is located 0.2m to the left of the left bearing. The pinion delivers power to another gear mounted directly behind it such that the tangential force on the pinion acts vertically upwards. Assume minor shock loads on the shaft, determine the necessary diameter of the shaft if the allowable shear stress is limited to 60 MPa. (20 Marks)
- 6 a. Design a cotter joint to resist a load of 50 kN, which acts along the axes of the rods connected by a cotter. The material of the rod and cotter is the same. Take the working stresses in the material as 100 MPa in tension, 50 MPa in shear and 150 MPa in crushing. (10 Marks)
- b. Design a protective type cast iron flange coupling for steel shaft transmitting 40 kW power at 200 rpm. The allowable shear stress in the shaft and key material is 40 MPa. The allowable shear stress in the steel bolt and cast iron flanges are 60 MPa and 10 MPa respectively. (10 Marks)
- 7 a. Design a triple riveted butt joint with double straps of equal width longitudinal butt joint for the boiler shell of 1.5 m diameter. The maximum steam pressure is 2.6 N/mm². The allowable stresses in tension, shear and crushing are 124 N/mm², 93 N/mm² and 165 N/mm² respectively. The pitch in the outer rows in each plate is twice the pitch of rivets in the inner row. Assume that the rivets in double shear are 1.875 times stronger than in single shear and the joint efficiency as 80%. (10 Marks)
- b. A steel plate of 10mm thick is welded to a vertical support using four sides 6mm fillet welds as shown in Fig.Q7(b). Find the safe load P if the permissible shear stress in the weld is 75 N/mm².

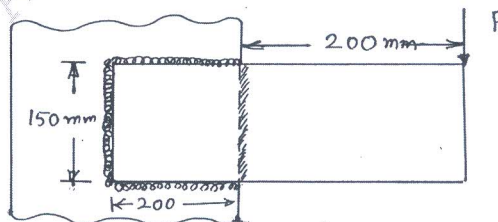


Fig.Q7(b)

(10 Marks)

- 8 a. Explain self locking screw. (04 Marks)
- b. A machine slide weighing 12 kN is raised by a single start square threaded steel screw. The allowable stress in the material is 72.5 MPa. The mean diameter of the collar is 40mm. The nut is made of phosphor bronze having design stress of 45 MPa. The bearing pressure between the screw and the nut is 9 MPa. Determine the dimensions of screw and nut and the power required to raise the slide. The maximum speed of the slide is 0.4 m/min. (16 Marks)

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