



- 12.a) Determine the required diameter of a shaft which carries two pulleys; it is 600 mm long, is simply supported at the two ends, and the two pulleys are so located that they divide the shaft in three equal parts. Belt pull on the left pulley is 12kN vertical, while the pull on the right pulley is 12kN horizontal. The shaft transmits a torque of 2kN-m between the pulleys. (16 marks)

(OR)

- 12.b) Design and draw a cast iron protected type flange coupling to connect two shafts of 36mm diameter transmitting 15kW at 720rpm. The overload capacity is 1.25 times the average torque. The bolts and keys are made of C20-steel and the flanges are made of FG 200. (16 marks)

- 13.a) Determine the forces acting on all the rivets and the size of the rivet for the structural joint shown in the Figure.13.a) (16 marks)

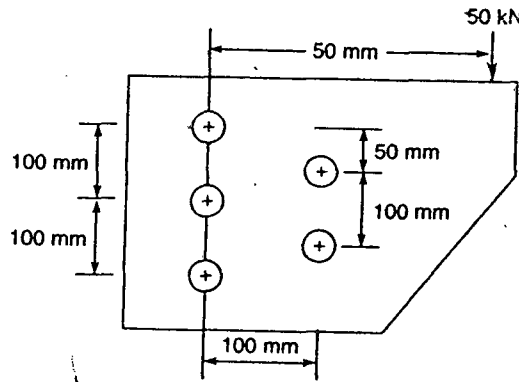


Figure. 13.a)

(OR)

- 13.b) A bracket is welded to a column as shown in the Figure 13.b). Calculate the size of the weld. (16 marks)

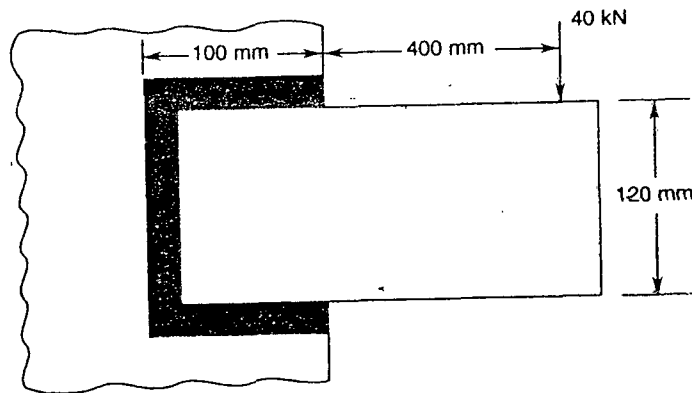


Figure 13.b)

- 14.a) From a toy gun, a bullet of 1N is fired. The bullet travels a distance of 10 m. the compression of the spring, when the gun is loaded, is 100 mm and the bore of the barrel is 20 mm. Design a suitable spring. (16 marks)

(OR)

- 14.b) Design a leaf spring for the rear axle of a tractor trolley. The load on the rear axle of the trolley is 10,000 N. the span is 1200 mm and the width of clamp is 100 mm. in all, 12 leaves are used out of which two main leaves and the remaining graduated leaves. (16 marks)
- 15 a) Design a journal bearing to carry a radial load of 3000N. the journal having 50 mm diameter rotates at 1500 rpm. The viscosity of oil at the operating temperature is 25 cP. (16 marks)

(OR)

- 15.b) Design a flywheel for a press using the following data: (16 marks)
- Work done at the crank shaft per revolution = 10kJ
  - Duration of punching operation = 30% of revolution of the crank shaft
  - Mechanical efficiency = 80%
  - Coefficient of steadiness = 5
  - Speed of crank shaft = 40 rpm.
- The crank shaft is geared to a driving shaft and the speed reduction ratio is 6:1. The flywheel is mounted on the driving shaft.
- Maximum available space = 1 m.