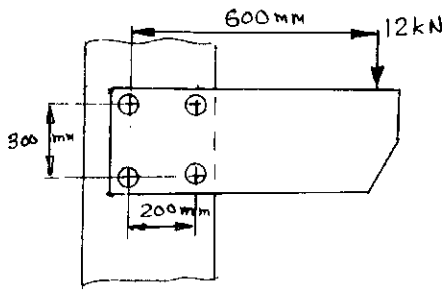




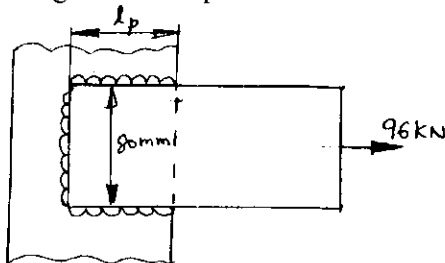
- b. A bracket is bolted as shown in Fig.Q.4(b). All the bolts are of the same size and are made of steel having allowable shear stress as 72MPa. Determine the size of bolts to be used. (10 Marks)

Fig.Q.4(b)

**PART – B**

5. A mild steel shaft transmits 15kW at 600rpm. It is supported on two bearings 1.2m apart. The shaft receives power through a 420mm diameter pulley mounted at 200mm to the right of left bearing. The power is given out through a gear of 200mm diameter located at 250mm to the left of right bearing. The belt drive is downward at an angle of  $60^\circ$  to horizontal with tensions ratio of 2.7. The gear drives with a downward tangential force. Find suitable diameter of the shaft taking allowable normal and shear stresses as 90MPa and 54MPa respectively. The combined shock and fatigue factors in bending and torsion are 1.75 and 1.25 respectively. (20 Marks)
6. a. Design a cotter joint to connect two round rods and to support an axial load of 120kN. The allowable stresses are: 90MPa in tension, 60MPa in shear and 150MPa in crushing. (10 Marks)
- b. Design a C.I. flange coupling to transmit 18kW at 1440 rpm. The allowable stresses for shafts, keys and bolts are 75MPa in shear and 150MPa in crushing. The allowable shear stress for C.I. flange is 5MPa. (10 Marks)
7. a. Design a double riveted double cover butt joint for the longitudinal seam of a boiler of diameter 1.2m and for a steam pressure of 2.4MPa. The following stresses may be used. Allowable tensile stress = 90MPa, allowable shear stress = 60MPa and allowable crushing stress = 150MPa. Assume a joint efficiency of 80%. (10 Marks)
- b. A 80mm wide 12mm thick plate carrying an axial load of 96kN is welded to a support as shown in the Fig.Q.7(b). The allowable tensile and shear stress in the weld are 100MPa and 70MPa respectively. Find the length of each parallel fillet weld. (10 Marks)

Fig.Q.7(b)



8. a. The lead screw of a lathe machine has single start trapezoidal threads of 30mm outside diameter and 6mm pitch. It drives the tool carriage against an axial load of 1500N. The thrust collar has a mean diameter of 40mm. The carriage is moved at a speed of 0.72m/min. The coefficient of friction for both screw and collar is 0.14. Find the power required to drive the screw and the efficiency. (10 Marks)
- b. A power screw has 6mm pitch and 40mm diameter. The screw is subjected to an axial load of 6kN. The nut length is 12mm. Determine:
- The bearing pressure between threads.
  - Shear stress in the threads due to axial load and
  - Compressive stress in the screw.
- (10 Marks)

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