

Design

Question one (10 marks)

- a) What are the types of fillet welding?
- b) It is required to replace the bolted joint, shown in Fig. 1, by the welded joint, shown in Fig. 2. Find the least weld size (h) required in order to have the same strength of the bolted joint and also the same value of the force F . The following allowable stresses must be considered:
- 1) The allowable shear stress for the 3M6 through bolts is 150 MPa.
 - 2) The allowable shear stress for welding is 140 MPa.

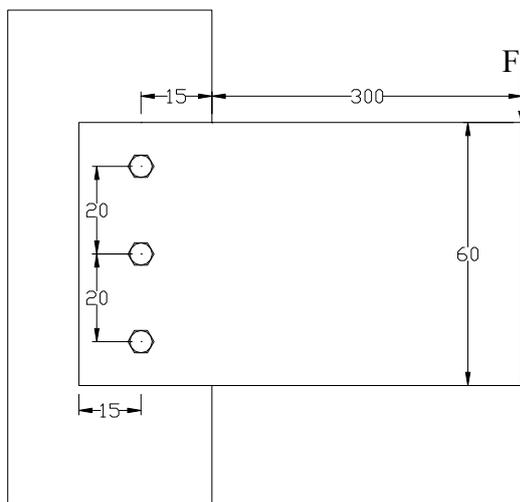


Fig. 1

Dimensions in mm.

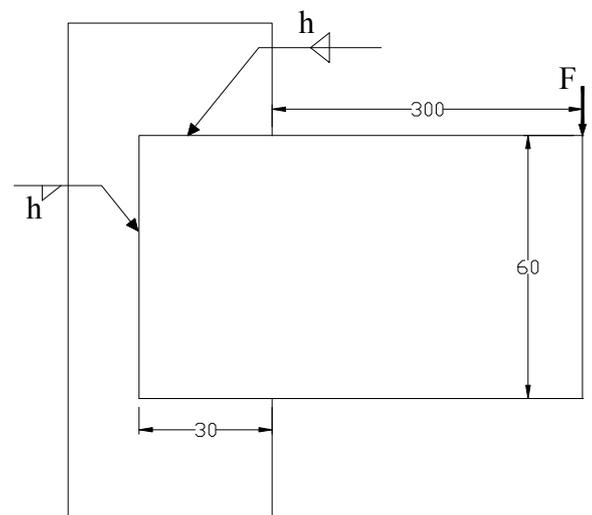


Fig. 2

Question two (10 marks)

- a) What are the advantages of using belt drive?
- b) Find the number of V-belt required to transmit 2 kW from a motor running with 900 rpm and has a sheave diameter of 200 mm to 400 mm sheave 1.5 m apart. Assume $\mu = 0.3$, $W = 11 \text{ kN/m}^3$, $A = 140 \text{ mm}^2$, $\sigma_{all} = 2 \text{ MPa}$, groove angle = 38° , service factor is unity.

You may use these equations if needed:

$$\theta_1 = 180 \mp 2 \sin^{-1} \left(\frac{d_2 - d_1}{2C} \right) \quad \& \quad L = \frac{\theta_1 d_1 + \theta_2 d_2}{2} + 2 \sqrt{C^2 - \left(\frac{d_2 - d_1}{2} \right)^2}$$