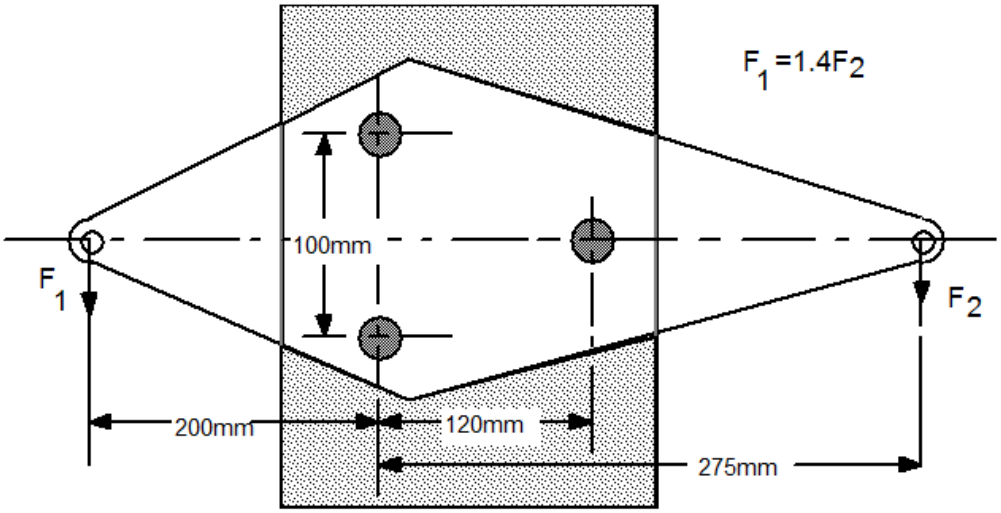
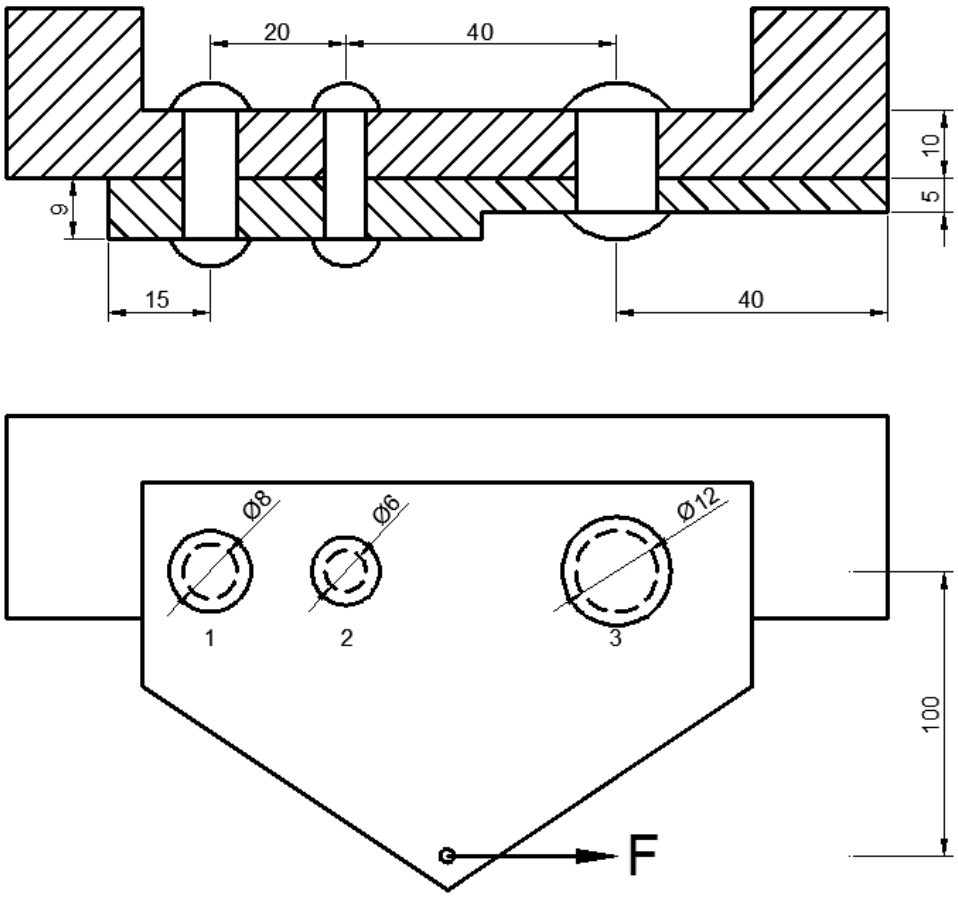
TUTORIAL – RIVETED JOINTS

Q.1. The plate shown is made of UNS G 10350 Cold drawn, and is fastened to an I beam (UNS G 10150 Cold drawn, Sy=320 MPa, Su=385 MPa) by three rivets that are made of a steel equivalent to UNS G 10100 Cold drawn (Sy=300 MPa, Su=365 MPa). Thickness of the plate (Sy=460 MPa, Su=550 MPa) and of the flanges of the I beam is 15 mm. Diameter of the rivets is 20 mm. What safe loads F_1 and F_2 can be supported by the riveted joint for a factor of safety of 2. Use distortion energy theory of failure. (F_1=1.4F_2)



Q.2. Two plates of different thicknesses, made from AISI 1020 steel (Sy=490 MPa, Sut=590 MPa), are fastened using three rivets of different diameters with Sy=460 MPa and Sut=550 MPa as shown below. The joint is designed with a factor of safety of 4, and failure modes to be considered are shearing of the rivet and bearing of the rivet and the plate. Using the Tresca failure criterion, calculate the load-carrying capacity of the joint.



Q.3. Rivets have same size and material, plates are the same. Which configuration has higher load carrying capacity?

($F_i' = \frac{FA_i}{A_1+A_2}$ $F_i'' = \frac{Mr_iA_i}{r_1{}^2A_1+r_2{}^2A_2}$) (a=10 cm, b=20 cm)