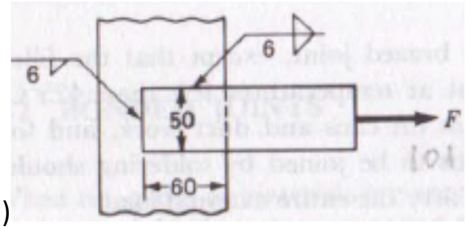
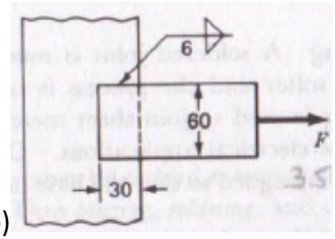
Tutorial Design of welded design

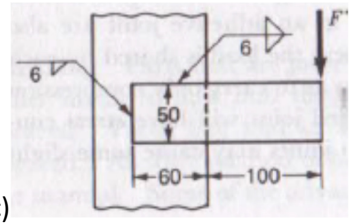
Q.1 The permissible shear stress for the welds shown is 140 MPa. For each case find the load F that would cause such stress. Dimensions are in mm; all bars are 10 mm thick



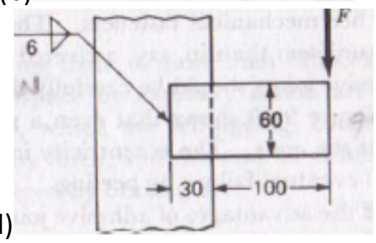
(a)



(b)



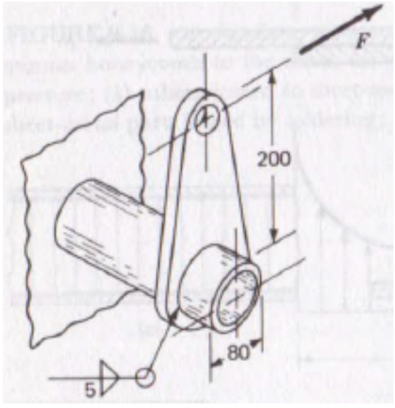
(c)

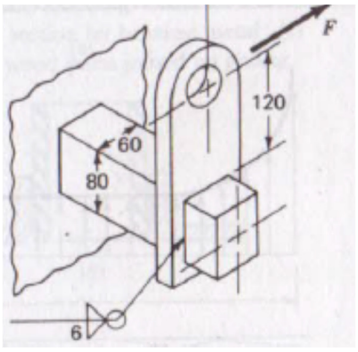


(d)

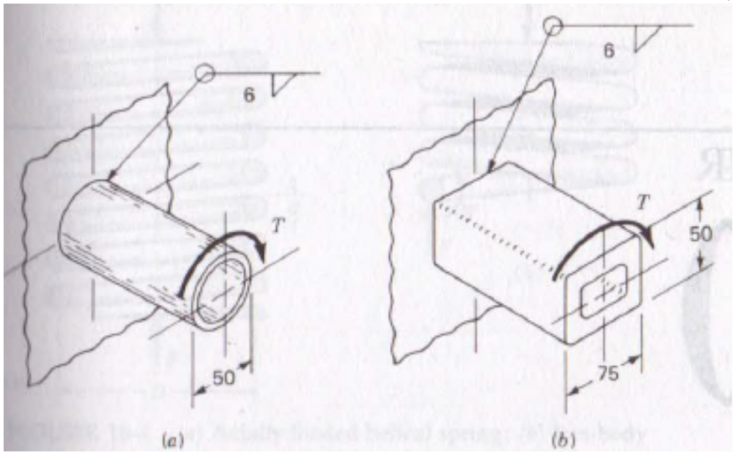
Ans. (a) 101 kN; (b) 35.7 kN; (c) 12.67 kN; (d) 9.09 kN

Q.2 Find the load f that will produce a maximum shear stress of 140 MPa in the welds shown in the figure.

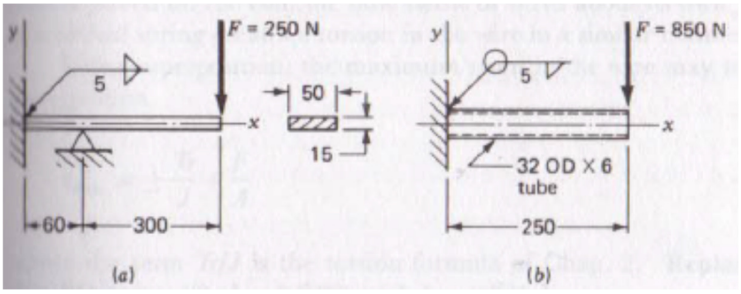




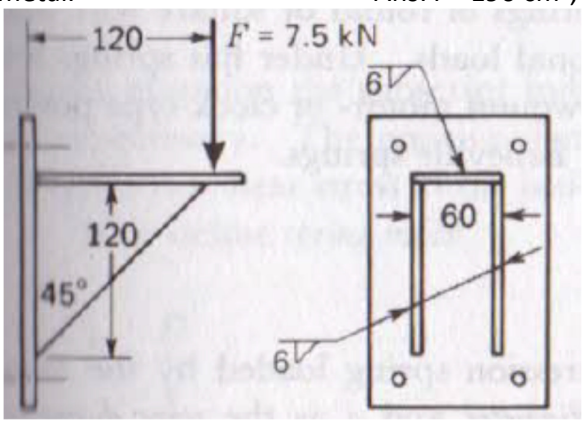
Q.3 Find the torque T that can be applied to each of the weldments shown if the permissible weld shear stress is 140 MPa. Ans. 2330 N-m; (b) 4280 N.m



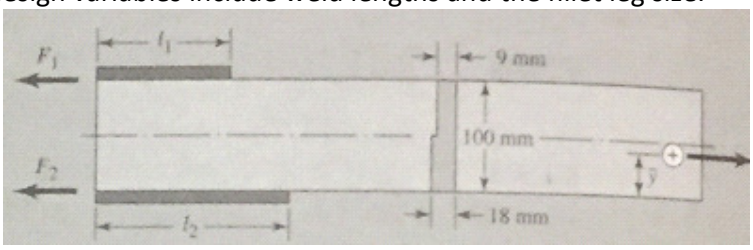
Q.4 The beams shown in the figure are welded to fixed supports as shown. For each case find the maximum combined shear stress in the weld metal



Q.5 A force F = 7.5 acts on the bracket shown in the figure. Find the maximum combined stress in the weld metal. Ans: I = 196 cm^4, τ_{max} = 17.6 MPa



Q.6 A specially rolled A36 structural steel section for the attachment has a cross section as shown in Figure and has yield and ultimate tensile strengths of 248 MPa and 400 MPa, respectively. It is statically loaded through the attachment centroid by a load of F = 200 kN. Unsymmetrical weld tracks can compensate for eccentricity such that there is no moment to be resisted by the welds. Specify the weld track lengths l_1 and l_2 for a 8 mm fillet weld using an E70XX electrode. This is part of a design problem in which the design variables include weld lengths and the fillet leg size.



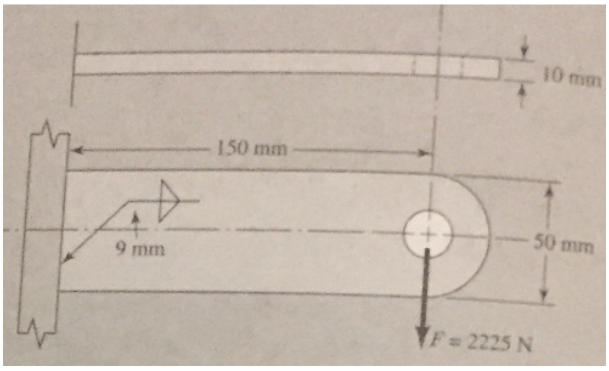
Ans: considering weld strength: l_1 = 50.90 mm and l_2 = 71.3 mm

Considering attachment shear strength: l_1 = 105 mm and l_2 = 147 mm

Q.7 Determine the factor of safety of the statically loaded welded cantilever carrying 2225 N depicted in the Figure. The cantilever is made of AISI 1018 HR steel and welded with a 9 mm fillet weld as shown in the figure. An E6010 electrode was used, and the design factor was 3.0.

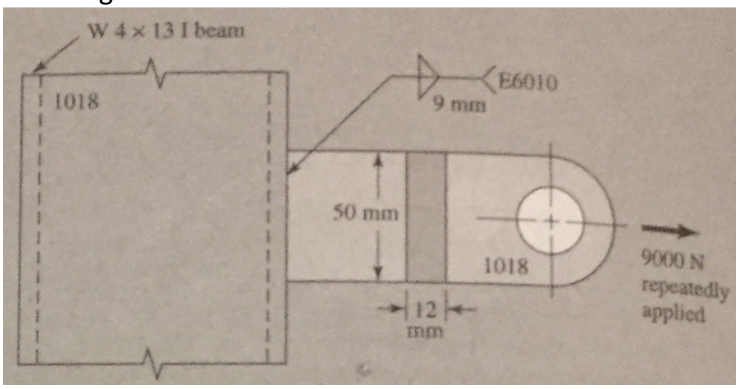
(a) Use the conventional method for the weld metal.

(b) Use the conventional method for the attachment (cantilever) metal.



Ans: (a) 3.5 (b) 2.75

Q.8 The AISI 1018 HR steel strap of Figure has a repeatedly applied load of 9000 N (Fa = Fm = 4500 N). Determine the fatigue factor of safety fatigue strength of the weldment using DE-Gerber fatigue failure criterion.



Ans: n_f = 5.05 as per DE-Gerber fatigue failure criterion