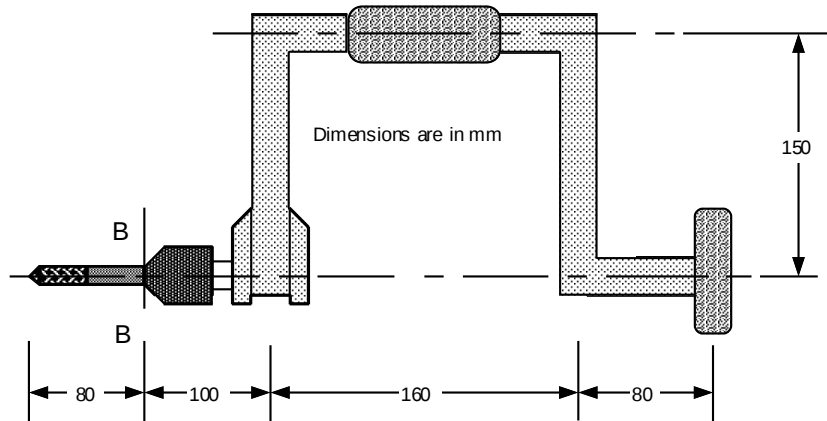


TUTORIAL – STRESS ANALYSIS

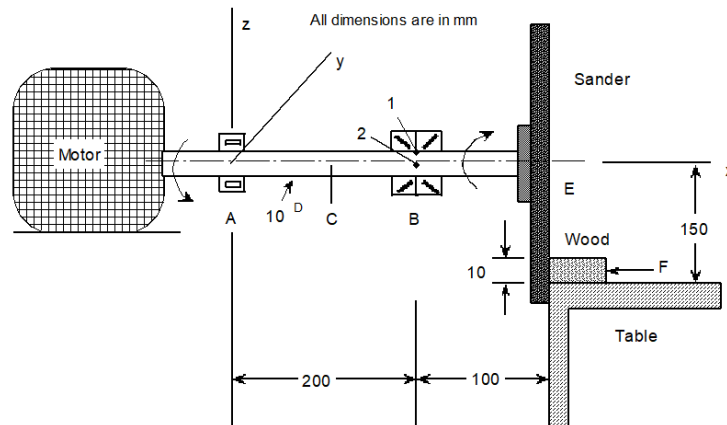
Example 1. Consider the hand brace shown below. When boring a hole in a wood, maximum thrust and maximum torque applied are 225 N and 3 Nm respectively.

a) Calculate the reactional forces at the tip point of the bit.

b) The drill used has a shank diameter of 6 mm where it is mounted in the chuck at section B-B. If the distance from B-B to the surface of the wood is 80 mm, find the largest of the normal stresses at this section when the plane of the brace is vertical. Calculate the shear stress at the same point. Draw the Mohr's circle and determine principal stresses and principal direction for the point facing negative z-axis.



Example 2. Consider the disk sander shown in figure below. The force that should be applied to the wood block is 10 N and the coefficient of friction between sander and wood is assumed to be 2.

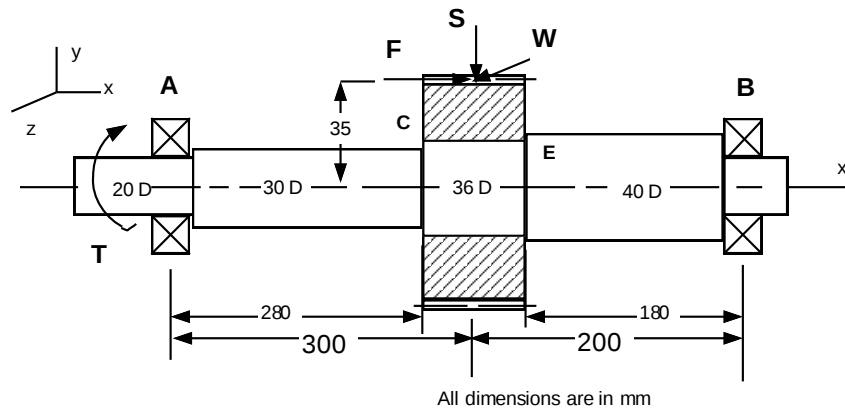


Bearing at right end (point B) is considered to take thrust and radial loads while the bearing at left end (point A) is to carry only radial load. Neglecting transverse shear stresses,

a) Draw the stress elements at points 1 and 2, show the stresses acting on them and calculate the principal stresses.

b) Determine all stress components, if these elements are located at the midpoint between the bearings.

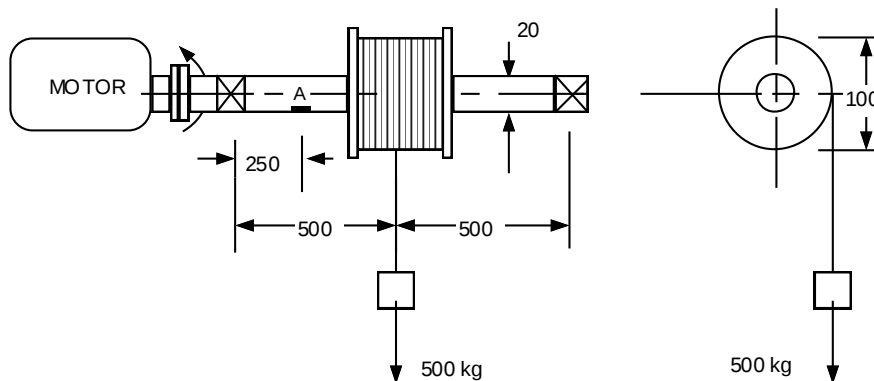
Example 3. A shaft as shown in the following figure is subjected to a load which has three components: a vertical radial force $S=8.8$ kN, a rightward thrust force of $F=15$ kN and tangential force $W=10$ kN. Dimensions of the shaft are given in the figure. The left hand support (bearing at A) is considered to take the thrust load.



Two stress elements located on the surface and identified in the sections shown are: C on top ; E is on the front side.

- Draw each of the stress elements properly oriented with respect to xyz, show the stresses which act upon them.
- Calculate the principal stresses at point E. Show the proper orientation (principal direction) of the element.

Example 4. Consider the following load raising system.



- Calculate the power of the motor if the load is to be raised at a constant speed of 2 m/s.
- Calculate stresses at the element located at point A.