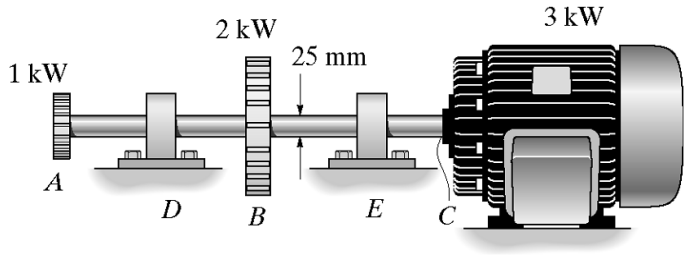
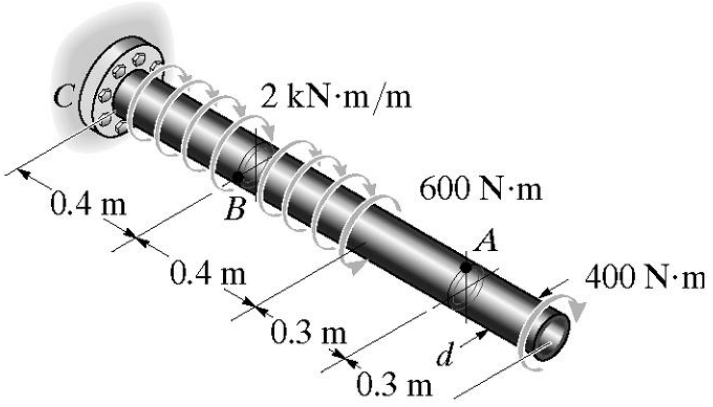
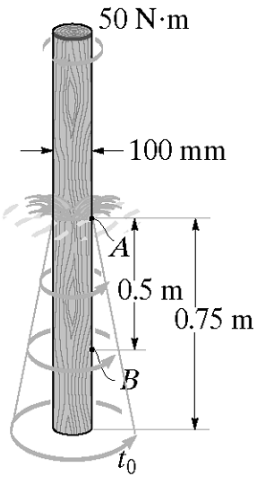
1. The solid steel shaft *AC* has a diameter of 25 mm and is supported by smooth bearings at *D* and *E*. It is coupled to a motor at *C*, which delivers 3 kW of power to the shaft while it is turning at 50 rps. If gears *A* and *B* remove 1 kW and 2 kW, respectively, determine the maximum shear stress developed in the shaft within regions *AB* and *BC*. The shaft is free to turn in its support bearings *D* and *E*.




2. The 60-mm diameter solid shaft is subjected to the distributed and concentrated torsional loadings shown. Plot the torque diagram and determine the absolute maximum and minimum shear stresses in the shaft and specify their locations, measured from the fixed end.



3. The wooden post, which is half buried in the ground, is subjected to a torsional moment of 50 N·m that causes the post to rotate at constant angular velocity. This moment is resisted by a linear distribution of torque developed by soil friction, which varies from zero at the ground to $t_0$ N·m/m at its base. Determine the equilibrium value for $t_0$, and then calculate the shear stress at points *A* and *B*. which lie on the outer surface of the post.




4. The solid shaft of radius *r* is subjected to a torque *T*. Determine the radius *r'* of the inner core of the shaft that resists one-half of the applied torque (*T*/2). Solve the problem two ways: (a) by using the torsion formula, (b) by finding the resultant of the shear-stress distribution.