Problem 1
The slender bars $AB$ and $BC$ of the linkage in Fig. 1 have mass $m$ and length $l$, and the collar $C$ has mass $m_c$. A torsional spring at $A$ exerts a clockwise couple $k\theta$ on bar $AB$. The system is released from rest in the position $\theta = 0$ and allowed to fall. Neglecting friction, determine the angular velocity $\omega = d\theta/dt$ of bar $AB$ as a function of $\theta$.

![Fig. 1](image)

Problem 2
The 20-kg homogeneous rectangular plate is released from rest (Fig. a) and falls 200 mm before coming to the end of the string attached at the corner $A$ (Fig. b). Assuming that the vertical component of the velocity of $A$ is zero just after the plate reaches the end of the string, determine the angular velocity of the plate and the magnitude of the velocity of the corner $B$ at that instant.

![Diagram](image)

Problem 3
A slender bar of mass $m$ is released from rest in the vertical position and allowed to fall. Neglecting friction and assuming that it remains in contact with the floor and wall, determine its angular velocity as a function of $\theta$.

![Diagram](image)

Problem 4
The 0.1-kg slender bar and 0.2-kg cylindrical disk are released from rest with the bar horizontal. The disk rolls on the curved surface. What is the bar's angular velocity when it is vertical?