吴贤铭智能工程学院
SHIEN-MING WU SCHOOL OF INTELLIGENT ENGINEERING

Name: _____

Student ID: _____

Class: _____

Introduction to Dynamics and Vibration

Assignment 7

Semester 2, AY2021-2022

For Majors in: Robotics Engineering and Intelligent Manufacturing Engineering

Weighting: 2 % **No. pages:** 7 **No. Questions:** 6 **Total marks:** 100

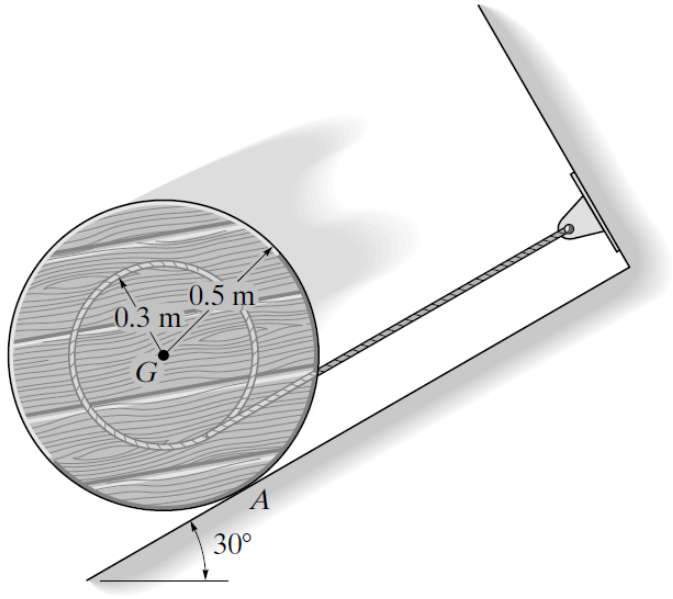
For examiner's use only.

Question	Points	Score
1	10	
2	10	
3	20	
4	20	
5	20	
6	20	
Total:	100	

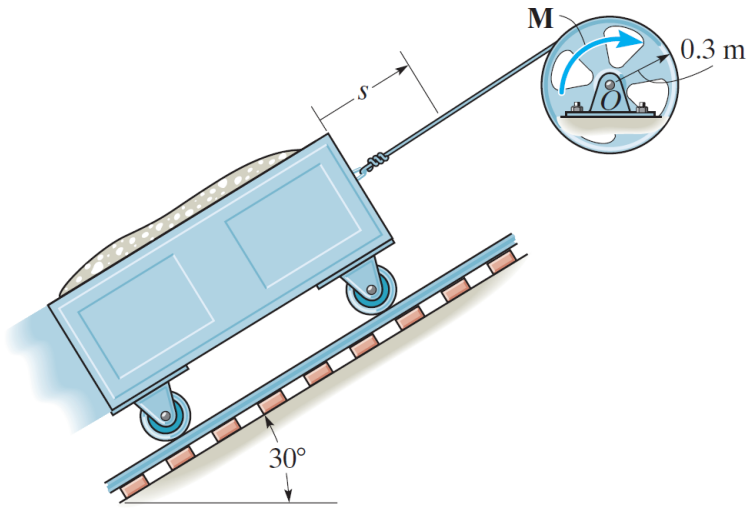
Instructions:

1. Please indicate clearly **your name both in English and Chinese, student ID and discipline information** (e.g. Robotic Engineering or Intelligent Manufacturing Engineering) at the beginning of your assignment.
2. Please mark the final answer by **#** or **//** for each question so that it is easy to identify.
3. Submit your assignment in a clear **PDF format on Blackboard (BB)**. Other format such as zipped file or word, may leads to invalid submission.
4. Pay close attention to the **submission deadline** indicated on BB. Late submission will lead to mark deduction or invalid submission. No submission is accepted via other channel.
5. Please **double check your assignment before submission**. Only one submission chance is granted for each assignment.
6. **Feedbacks** will be offered online or by informal queries with TA or instructors.

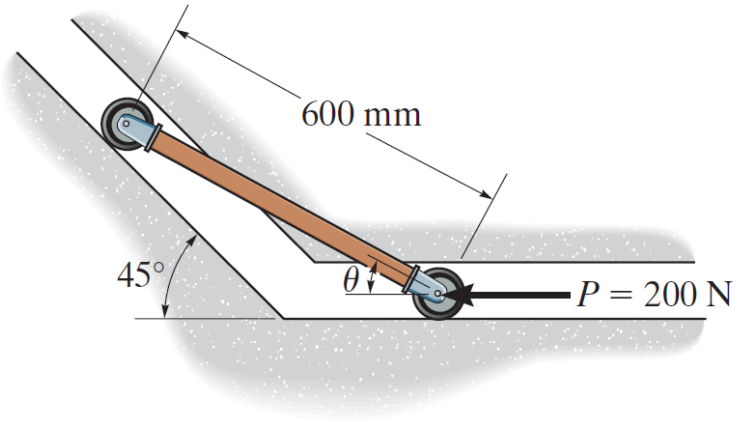
1. (10 marks) The spool has a mass of 60 kg and a radius of gyration $k_G = 0.3$ m. If it is released from rest, determine how far its center descends down the smooth plane before it attains an angular velocity of $\omega = 6$ rad/s. Neglect friction and the mass of the cord which is wound around the central core.



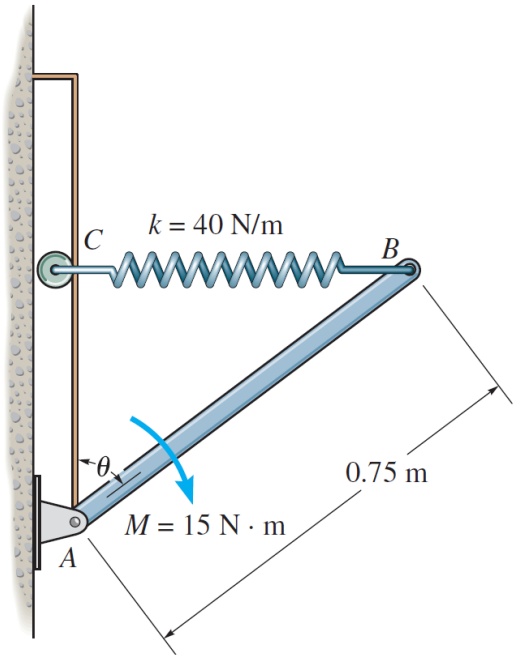
2. (10 marks) The wheel has a mass of 100 kg and a radius of gyration of $k_O = 0.2$ m. A motor supplies a torque $M = (40\theta + 900)\text{N} \cdot \text{m}$, where θ is in radians, about the drive shaft at O. Determine the speed of the loading car, which has a mass of 300 kg, after it travels $s = 4$ m. Initially the car is at rest when $s = 0$ and $\theta = 0°$. Neglect the mass of the attached cable and the mass of the car's wheels.



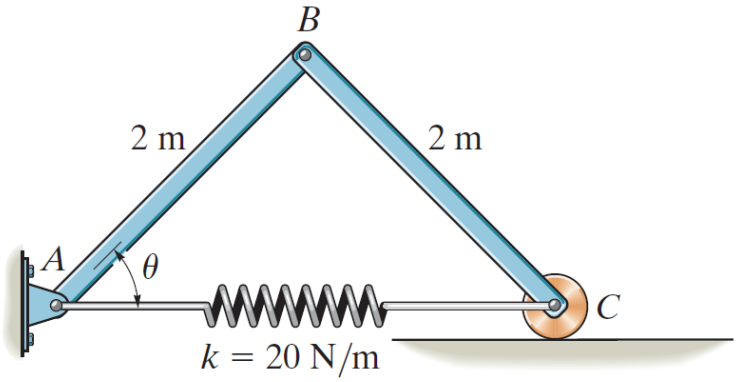
3. (20 marks) If $P = 200$ N and the 15 -kg uniform slender rod starts from rest at $\theta = 0°$, determine the rod's angular velocity at the instant just before $\theta = 45°$.



4. (20 marks) The $10-\text{kg}$ rod AB is pin-connected at A and subjected to a couple moment of $M = 15\ \text{N}\cdot\text{m}$. If the rod is released from rest when the spring is unstretched at $\theta = 30°$, determine the rod's angular velocity at the instant $\theta = 60°$. As the rod rotates, the spring always remains horizontal, because of the roller support at C.



5. (20 marks) The two 12 − kg slender rods are pin connected and released from rest at the position $\theta = 60°$. If the spring has an unstretched length of 1.5 m, determine the angular velocity of rod BC, when the system is at the position $\theta = 0°$. Neglect the mass of the roller at C.



6. (20 marks) The $10-\text{kg}$ rod AB is pin-connected at A and subjected to a couple moment of $M = 15\ \text{N}\cdot\text{m}$. If the rod is released from rest when the spring is unstretched at $\theta = 30^\circ$, determine the rod's angular velocity at the instant $\theta = 60^\circ$. As the rod rotates, the spring always remains horizontal, because of the roller support at C.