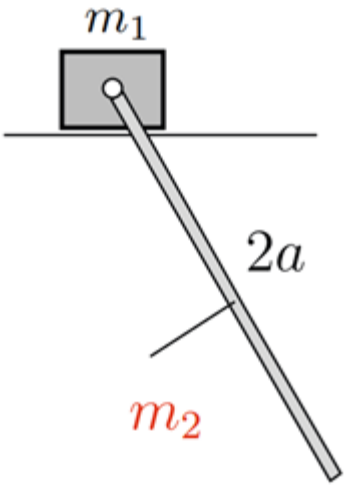
YILDIZ TECHNICAL UNIVERSITY FACULTY OF CIV. ENG. - DIV. OF CIV. ENG. MECHANICS DIVISION		2021-2022 FALL DYNAMICS HOMEWORK

NAME:	**NO:**	**GROUP:**

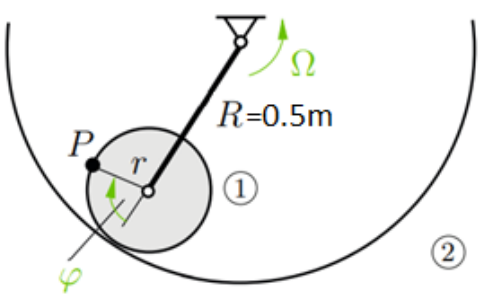
DEADLINE: 28.12.2021 / Hours: 12:00-14:00 **Res. Assist. Dr. Yurdakul AYGÖRMEZ** **Room: 2 – 030**	**NOTE: Any homework submitted after the deadline will be void.** **NOTE: Homeworks will be delivered by hand.**

1) A block (mass m_1) can move horizontally on a smooth surface. A homogeneous rod (mass m_2) is connected to the block by a pin. The rod is displaced from its equilibrium position and then released. Find the equations of motion for the special case $m_1 = m_2$. **(**m_1 is the last two digits of the student number for example if student ID is 102560332 then m_1=32 kg. If the last two digits of the student number is 00 then m_1=12 kg**)**

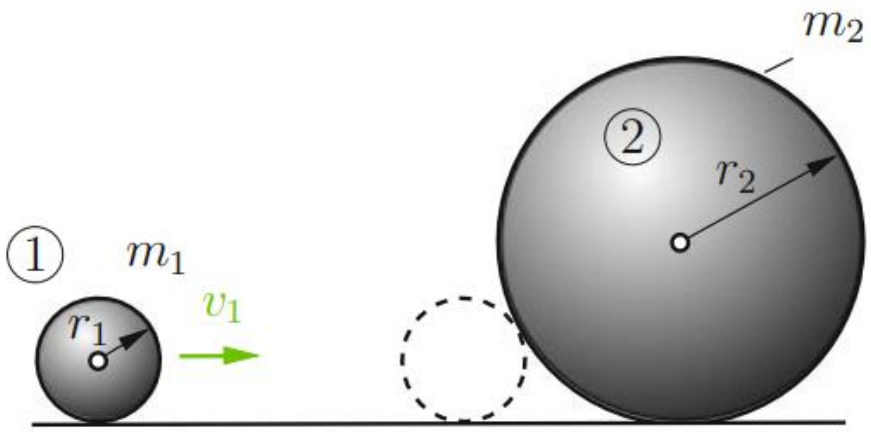


2) Wheel ① rolls in a gear mechanism without slip along circle ②. The mechanism is driven with a constant angular velocity Ω. Determine the magnitudes of the velocity and the acceleration of point P on the wheel.(r=R/2)

(φ is the last two digits of the student number for example if student ID is 102560332 then $\varphi = 32^o$, if the last two digits are zero e.g. …..00 take $\varphi = 10^o$) (Ω is the last two digits of the student number for example if student ID is 102560332 then $\Omega = 32\ rad/s$, if the last two digits are zero e.g. …..00 take $\Omega = 10\ rad/s$)



3) A ball ① (mass m_1) hits a second ball ② (mass m_2, velocity $v_2=0$) with a velocity v_1 as shown in Figure. Assume that the impact is partially elastic (coefficient of restitution e=0.6) and all surfaces are smooth. Given: $r_2=3r_1$, $m_2=4m_1$. Determine the velocities of the balls after the collision.
(m_1 is the last two digits of the student number. For example if student ID is 102560332 then m_1=32 kg. If the last two digits are zero e.g. …..00 take m_1=10 kg) (v_1 is the last two digits of the student number. For example if student ID is 102560332 then v_1=32 m/s. If the last two digits are zero e.g. …..00 take v_1=10 m/s) (r_1 is the last digit of the student number. For example if student ID is 102560332 then r_1=2 m. If the last digit is zero e.g. ……0 take r_1=1 m)



4) A car (mass m) is travelling with the constant velocity v along a banked circular curve (radius r, angle of slope α=30°), see Figure. The coefficient of static friction $\mu_0 = 0.35$ between the tyres of the car and the surface of the road is given. Determine the region of the allowable velocity so that sliding (down or up the slope) does not take place.
(m is the last two digits of the student number. For example if student ID is 102560332 then m=32 kg. If the last two digits are zero e.g. …..00 take m=10 kg) (v is the last two digits of the student number. For example if student ID is 102560332 then v=32 m/s. If the last two digits are zero e.g. …..00 take v=10 m/s) (r is the last digit of the student number. For example if student ID is 102560332 then r=2 m. If the last digit is zero e.g. …..00 take r=1 m)