107VE02

國立臺北科技大學 107 學年度碩士班招生考試

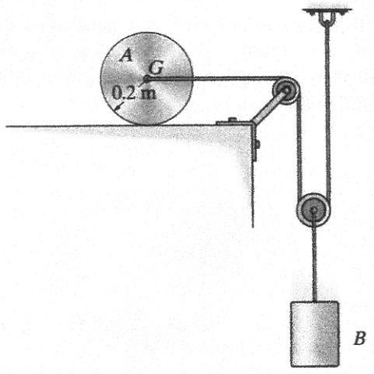
系所組別：1301 車輛工程系碩士班

第二節　動力學　試題　（選考）

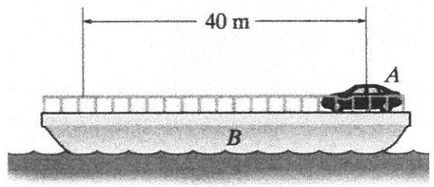
注意事項：

1. 本試題共 5 題，每題 20 分，共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. The 20-kg disk A is attached to the 10-kg block B using the cable and pulley system shown. If the disk rolls without slipping, determine the velocity and acceleration of the block B when it has moved 0.5 m, starting from rest. Also, what is the tension in the cable? Neglect the mass of the pulleys.



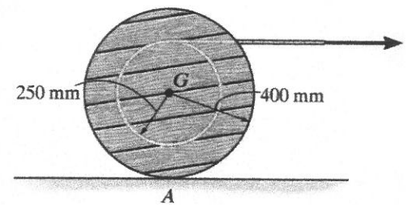
Problem 1



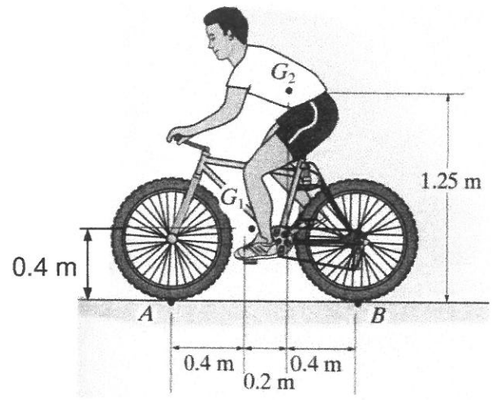
Problem 2

2. The 8000 kg barge B supports a 2000 kg automobile A. If someone drives the automobile to the other side of the barge, determine how far the barge moves. Neglect the resistance of the water.

3. The spool has a mass of 50 kg and a radius of gyration $k_G = 0.3$ m. If the coefficients of static and kinetic friction at A are $\mu_s = 0.2$ and $\mu_k = 0.15$, respectively, determine the angular acceleration of the spool if $P = 700$ N.



Problem 3



Problem 4

4. The mountain bike has a mass of 40 kg with center of mass at point G_1, while the rider has a mass of 60 kg with center of mass at point G_2. When the brake is applied to the front wheel, it causes the bike to decelerate at a constant rate of 3 m/s^2. Determine the normal reaction the road exerts on the front and rear wheels. Assume that the rear wheel is free to roll, neglect the mass of the wheels.

5. The 0.9-kg ball B, shown in the figure, is attached to a cord which passes through a hole at A in a smooth table. When the ball is $r_1 = 0.875$ m from the hole, it is rotating around in a circle such that its speed is $v_1 = 2$ m/s. By applying the force $\boldsymbol{F}$ the cord is pulled downward through the hole with a constant speed $v_C = 3$ m/s. Determine
(a) the speed of the ball at the instant it is $r_2 = 0.3$ m from the hole,
(b) the amount of work done by $\boldsymbol{F}$ in shortening the radial distance from r_1 to r_2.
Neglect the size of the ball.