國立臺北科技大學105學年度碩士班招生考試

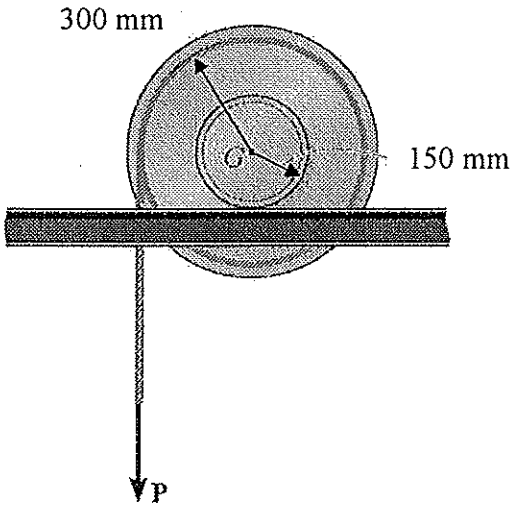
系所組別：1301 車輛工程系碩士班

第三節　動力學　試題　（選考）

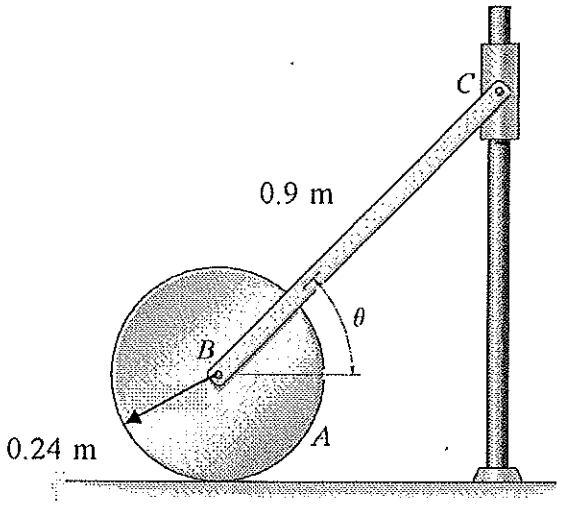
注意事項：

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 spool has a mass of 100 kg and a radius of gyration of $k_G = 200\ mm$ about its center of mass G. If a vertical force of P=500 N is applied to the cable, determine the acceleration of G and the angular acceleration of the spool. The coefficients of static and kinetic friction between the rail and the spool are $\mu_s = 0.2$ and $\mu_k = 0.15$ respectively.



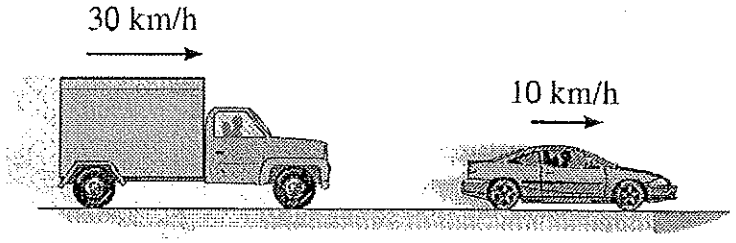
Problem 1



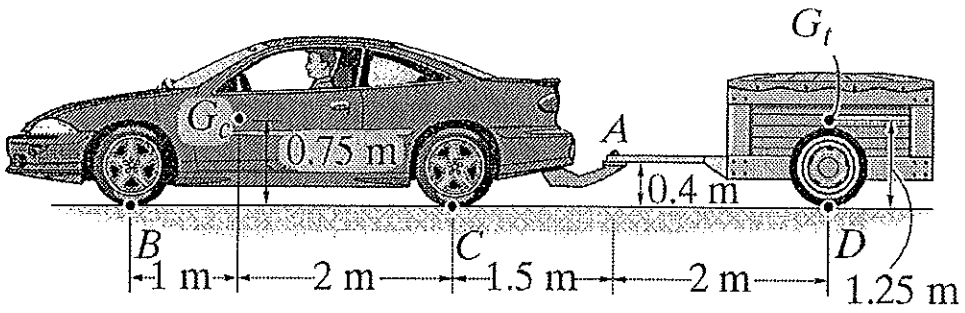
Problem 2

2. The system consists of a 10-kg disk A, 2-kg slender rod BC, and a 0.5 kg smooth collar C. If the disk rolls without slipping, determine the velocity of the collar at the instant $\theta = 30°$. The system is released from rest when $\theta = 45°$.

3. The 5-Mg truck and 2-Mg car are traveling with the free rolling velocities shown just before they collide. After the collision, the car moves with a velocity of 15 km/h to the right *relative* to the truck. Determine the coefficient of restitution between the truck and car and the loss of energy due to the collision.



4. The car, having a mass of 1.40Mg and mass center at G_c, pulls a loaded trailer having a mass of 0.8Mg and mass center at G_t. Determine the normal reactions on both the car's front and rear wheels and the trailer's wheels if the driver applies the car's rear brakes C and causes the car to skid. Take $\mu_k = 0.4$ and assume the hitch at A is a pin or ball-and-socket joint. The wheels at B and D are free to roll. Neglect their mass and the mass of the driver.



5. When the 5-kg box reaches point A it has a speed of $v_A = 2\ m/s$. Determine the angle θ at which it leaves the smooth circular ramp and the distance s to where it falls into the cart. Neglect friction.