

國立臺北科技大學九十六學年度碩士班招生考試

系所組別：1310 車輛工程系碩士班甲組

第一節 動力學 試題

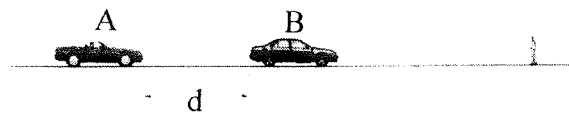
第一頁 共一頁

**注意事項：**

1. 本試題共 5 題，配分共 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。

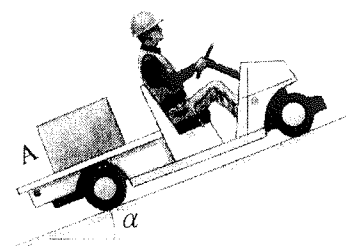
1. Car B is traveling a distance  $d$  ahead of car A. Both cars are traveling at 20 m/s when the driver of B suddenly applies the brakes, causing his car to decelerate at  $4\text{m/s}^2$ . It takes the driver of car A 0.75 second to react. When driver of car A applies his brakes, he decelerates at  $5\text{m/s}^2$ . Determine the minimum distance  $d$  between the cars so as to avoid a collision.

(20 %)



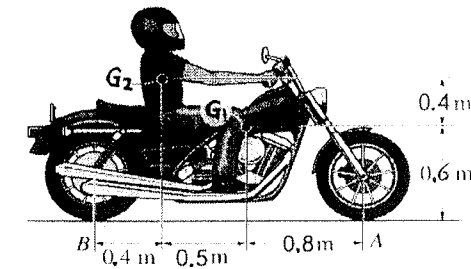
2. A utility vehicle is moving forwards at 4 m/s. The coefficients of friction between its load A and the bed of the vehicle are  $\mu_s = 0.5$ ,  $\mu_k = 0.45$ . If the slope angle  $\alpha$  is  $15^\circ$ , determine the shortest distance in which the vehicle can be brought to a stop without causing the load to slide on the bed.

(20 %)



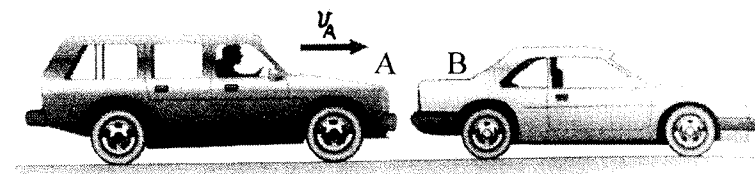
3. The motorcycle shown in the figure has a mass of 150 kg and a center of mass at  $G_1$ , while the rider has a mass of 70 kg and a center of mass at  $G_2$ . The coefficient of kinetic friction between the wheels and the road is  $\mu_k = 0.3$ . Determine the motorcycle's acceleration if the driving wheel in the back is always slipping.

(20 %)



4. Suppose you are investigating an accident in which a 1400 kg car A struck a parked 1200 kg car B. All four of B's wheels were locked, and skid marks indicate that it slid 2 m after the impact. If you estimate the coefficient of friction between B's tyres and the road to be  $\mu_k = 0.8$  and the coefficient of restitution of the impact to be  $e = 0.4$ . What was A's velocity just before the impact?

(20 %)



5. The 20 kg disk A of radius 0.2 m is attached to the 10 kg block B using the cable-and-pulley system. If the disk rolls without slipping, determine its angular acceleration and the acceleration of the block when they are released from rest. Also, what is the tension force in the cable? Neglect the mass of the pulleys and cable.

(20 %)

