

國立臺北科技大學

九十四學年度車輛工程系碩士班入學考試

動力學試題

填准考證號碼

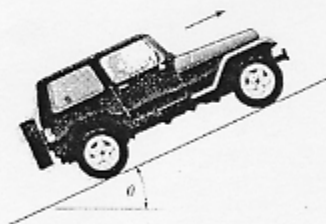
第一頁 共一頁

--	--	--	--	--	--	--	--

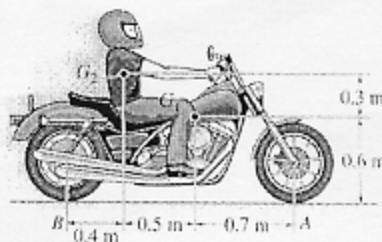
注意事項：

1. 本試題共五題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. A jeep has a weight 12 kN and an engine output a power of 75 kW with the efficiency $\varepsilon = 0.8$ which transmits to all the wheels. Assuming the wheels do not slip on the ground. Determine the angle θ of the largest incline the jeep can climb at a constant speed $v = 10\text{m/s}$.
(20%)

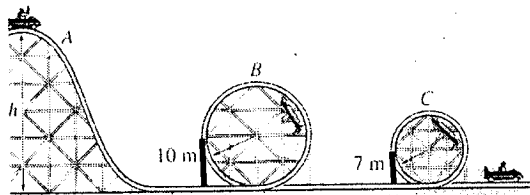


2. A motorcycle has a mass of 125 kg and a center of mass at G_1 , while the rider has a mass of 75 kg and a center of mass at G_2 . If the coefficient of static friction between the wheels and the road is $\mu_s = 0.8$, determine if it is possible for the rider to lift the front wheel off the ground. What acceleration is necessary to do this? Neglect the mass of the wheels and assume that the front wheel is free to roll.
(20%)



3. The roller-coaster car has a mass of 800kg, including its passenger. If it is released from rest at the top of the hill A . Determine the minimum height h of the hill so that the car travels around both inside loops without leaving the track. Neglect friction, the mass of the wheels, and the size of the car. What is the normal reaction force on the car when the car is at B and when it is at C ?

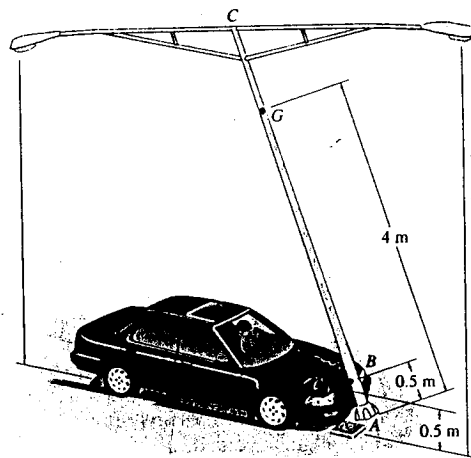
(20%)



4. The car strikes a light pole, which is designed to break away from the base with negligible resistance. From a video taken of the collision it is observed that the pole was given an angular velocity of 60 rad/s when AC was vertical. The pole has a mass of 175 kg, a center of mass at G, and a radius of gyration about an axis perpendicular to the plane of the pole and passing through G of $k_G = 2.25\text{m}$. Determine the horizontal impulse which the car exerts on the pole while AC is essentially vertical.

Center of mass G is at 4m from the ground, and the car hits the pole at position 0.5 m from the ground.

(20%)



5. The sphere of mass m falls and strikes the triangular block with a vertical velocity v . If the block rests on a smooth surface and has a mass of $3m$, determine its velocity just after the collision. The coefficient of restitution is e .

(20%)

