

# 國立臺北科技大學九十七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

填准考證號碼

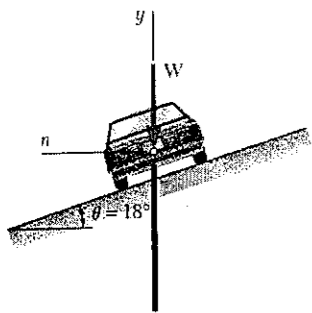
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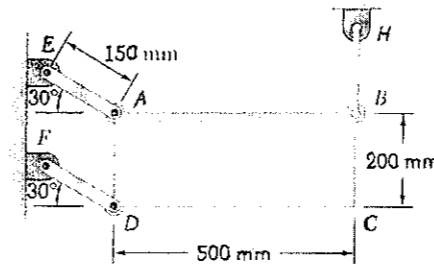
### 注意事項：

1. 本試題共 6 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。

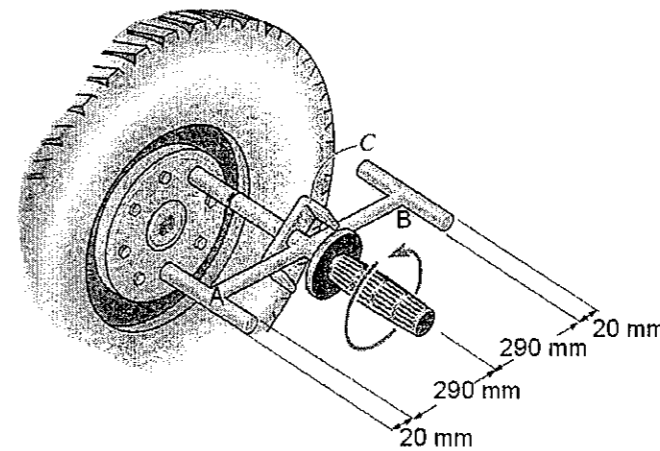
1. (a) Determine the rated speed of a highway curve of radius  $\rho = 122$  m banked through an angle  $\theta = 18^\circ$ . The rated speed of a banked highway curve is the speed at which a car should travel if no lateral friction force is to be exerted on its wheels. (5%)  
 (b) Determine the friction force required for a car to travel at 25 m/s on this banked highway curve. (10%)



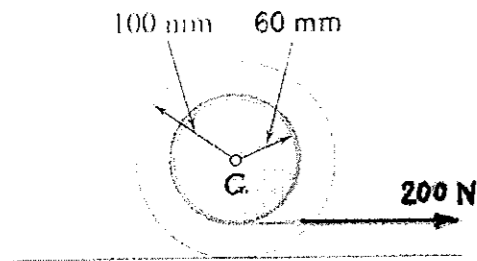
2. The thin plate ABCD of mass 8 kg is held in the position shown by the wire BH and two links AE and DF. Neglecting the mass of the links, determine immediately after wire BH has been cut  
 (a) the acceleration of the plate, (10%)  
 (b) the force in each link. (10%)



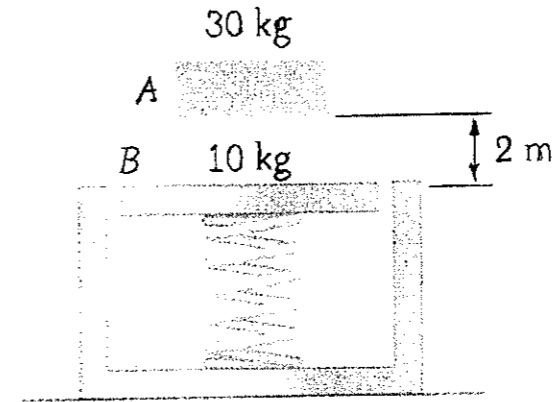
3. The impact wrench consists of a slender 1-kg rod AB which is 580 mm long, and cylindrical end weights at A and B that each has a diameter of 20 mm and a mass of 1 kg. This assembly is free to turn about the handle and socket, which are attached to the lug nut on the wheel of a car. If the rod AB is given an angular velocity of 4 rad/s and it strikes the bracket C on the handle without rebounding, determine the angular impulse imparted to the lug nut. (10%)



4. A cord is wrapped around the inner drum of a wheel and pulled horizontally with a force of 200 N. The wheel has a mass of 50 kg and a radius of gyration of 70 mm. Knowing that static coefficient of friction  $\mu_s = 0.20$  and kinetic coefficient of friction  $\mu_k = 0.15$ , determine the acceleration of G and the angular acceleration of the wheel. (20%)



6. A 30-kg block is dropped from a height of 2 m onto the 10-kg pan of a spring scale. Assuming the impact to be perfectly plastic, determine the maximum deflection of the pan. The constant of the spring is  $k = 20 \text{ kN/m}$ . (15%)



5. The 2-kg ball is thrown at the suspended 20-kg block with a velocity of 4 m/s. The coefficient of restitution between the ball and the block is  $e = 0.8$ .
- (a) Determine the maximum height  $h$  to which the block will swing before it momentarily stops. (10%)
- (b) If the time of impact between the ball and the block is 0.005 second, determine the average normal force exerted on the block during this time. (10%)

