國立臺北科技大學九十五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

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。

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1. The center of mass of a car is located at point **G** as shown in Fig.1. The coefficient of friction between the tyres and the roadway is **0.75**. What is the maximum acceleration of the car if the wheels are not to skid and the car is equipped with

   (1) rear-wheel drive, (10%)

   (2) four-wheel drive (assume that both axles are subjected to equal torques)? (10%)
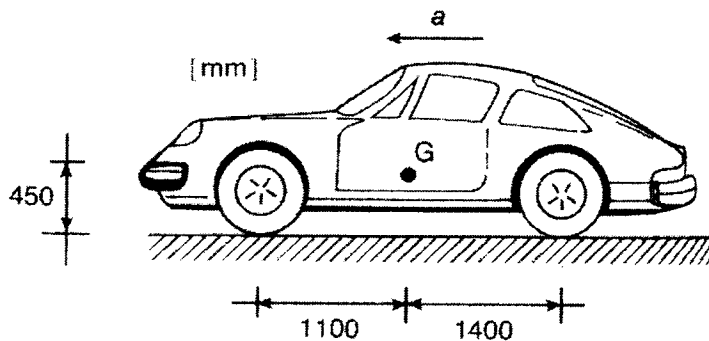

Fig.1

2. A small ball is projected as shown in Fig.2. It bounces along a smooth floor with a coefficient of restitution equal to **0.6**. Determine the length L of the second jump. (20%)
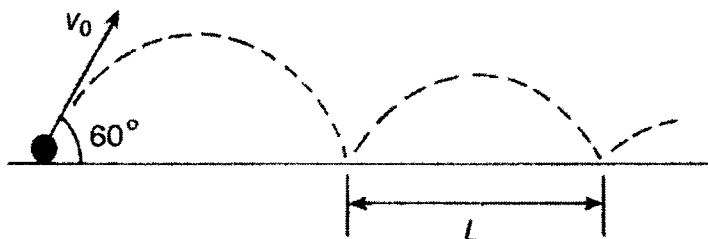

Fig.2

3. A truck of mass M is transporting a heavy section of a concrete pipe which may be considered as a thin shell of mass m with radius R. The pipe is fastened by a wire as shown in Fig.3. The truck starts and accelerations. When the truck has attained the velocity v the power output form the engine is P. At that instant the wire brakes and the pipe starts to roll along the platform. How is the acceleration of truck changed? The mass of the wheels may be neglected. (20%)
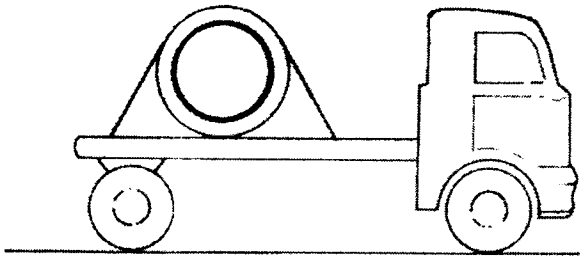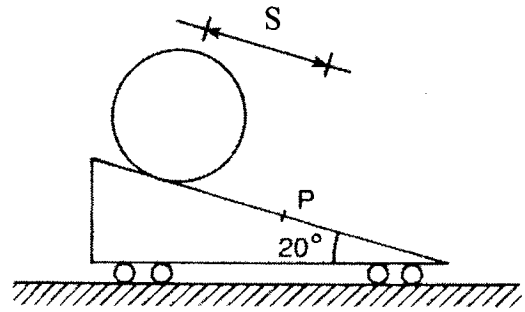

Fig.3

Fig.4

4. The prism-shaped vehicle shown in Fig.4 may move without any resistance along a horizontal surface. The mass of the vehicle is $2m$. A uniform cylinder of mass m with radius R may roll down the inclined top surface of the vehicle. The system is released from rest in the position shown. Determine the velocity of the vehicle when the cylinder reaches point P located at a distance S from the starting position. (20%)

5. A reel of thread of mass m is subjected to a force P as shown in Fig.5. The outer radius is R, the inner radius is $R/2$ and the radius of gyration with respect to the symmetry axis is $R/2$. Determine the acceleration of the centre of mass for the two cases shown. It is assumed that friction is sufficient for the reel to roll without slipping. (20%)
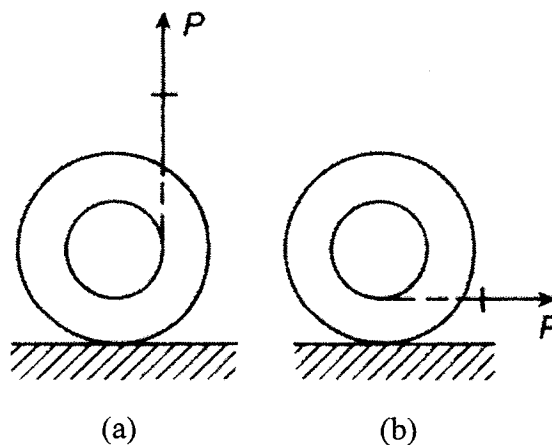

(a)   (b)

Fig.5