國立臺北科技大學 100 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，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。

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1. A 75-kg wheel has a radius of gyration about its mass center of k_G = 375 mm. Determine its angular acceleration, acceleration of its C.G., friction force, and normal force acting on the wheel. The coefficients of static and kinetic friction between the wheel and the ground are μ_s = 0.2 and μ_k = 0.15, respectively. Make sure to define coordinates, draw free-body diagram, kinetic diagram, and discuss the possible conditions. If (a) the wheel is subjected to a torque of M=100 N•m; (10%) (b) the wheel is subjected to a torque of M=150 N•m. (10%)
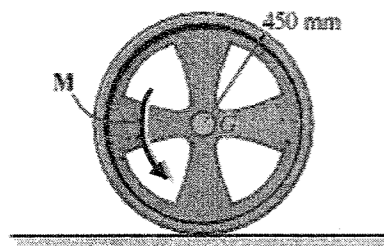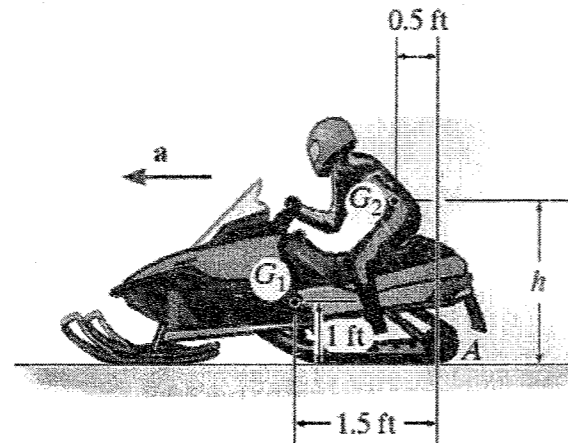

Figure for Problem 1.

Figure for Problem 2.

2. The snowmobile has a weight of 250 lb, centered at G_1, while the rider has a weight of 150 lb, centered at G_2. If h = 3 ft, determine the snowmobile's maximum permissible acceleration **a** so that its front skid does not lift off the ground. Also, find the traction (horizontal) force and the normal reaction under the rear tracks at A.

3. The epicyclic gear train consists of the sun gear A which is in mesh with the planet gear B. This gear has an inner hub C which is fixed to B and in mesh with the fixed ring gear R. If the connecting link DE pinned to B and C is rotating at ω_{DE} = 18 rad/s about the pin at E, determine the angular velocities of the planet and sun gears.
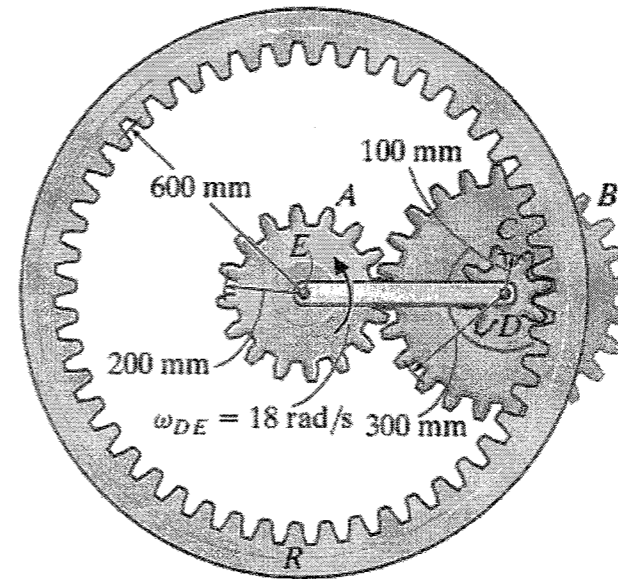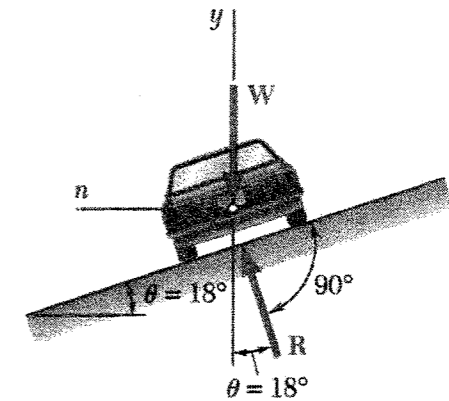

Figure for Problem 3.

Figure for Problem 4.

4. Determine the rated speed of a highway curve of radius r = 122 m banked through an angle θ = 18°. 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 at its wheels.

5. The three balls each have the same mass m=10 Kg shown in Figure. If A is released from rest at θ = 45°, determine the angle ϕ to which C rises after collision. The length l is 1m. The coefficient of restitution between each ball is e = 0.5.
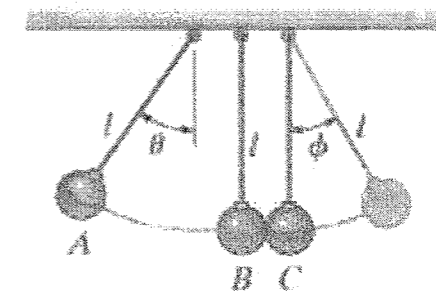

Figure for Problem 5.