※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (20%) Derive the mass moment of inertia about the z axis for the solid cone of mass m as shown. Express the result in the form: $I_{zz} = Cmr^2$ and find the constant C.
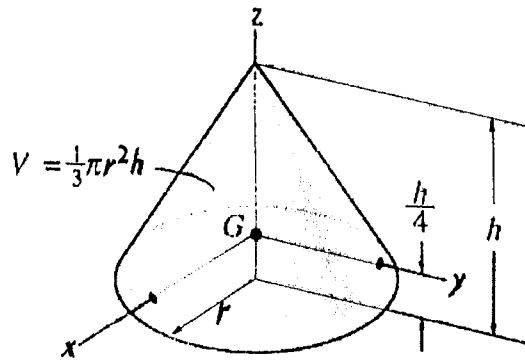
2. (20%) Determine the horizontal and vertical components of all forces acting on the member *ABCD* of the simply supported frame shown below. (Hint: find the support reactions first.)
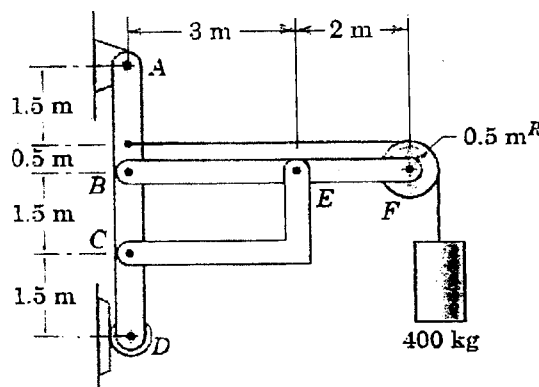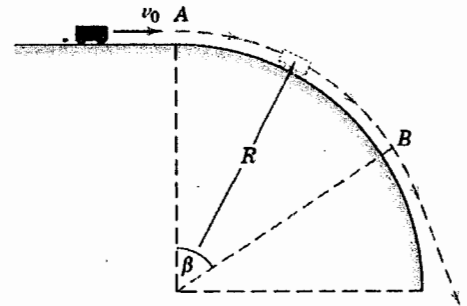
系所組別： 航空太空工程學系乙組

考試科目： 工程力學　　　　　　　　　　　　　　　　　　　考試日期：0222，節次：2

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(15%) 3. A small vehicle is released from rest ($v_o = 0$) at point A of the circular path and it gathers speed moving down the path in gravitational field. Determine the angle β where the vehicle leaves the path and becomes a projectile by

　　(1) assuming no friction, and

　　(2) with friction coefficient μ.

List the equation(s) that can be applied to calculate the angle.

(20%) 4.　Link OA has a counterclockwise constant angular velocity $\omega = 1$ rad/sec.　For $\theta = 45°$ at which instant AB is horizontal and BD is vertical, determine the angular velocity and acceleration of
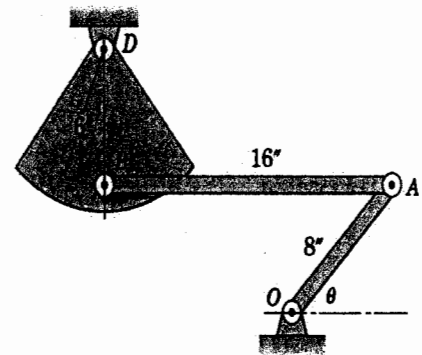
(1) link AB and

(2) rigid body BD

(25%) 5. A uniform rod of weight mg and length L is supported at horizontal position by a pin connection at point A and a wire of negligible mass at point B, (the moment of inertia about c.g. is $mL^2/12$ and about point A is $mL^2/3$).
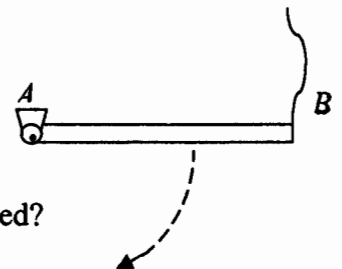
(1) What is the force on pin A at the instant when the wire is released?

(2) What is the force at pin A when the rod has rotated 45°?

(3) At which position (angle) will the reaction force on the vertical direction at pin A be zero?