1. The 40-kg block $A$ hangs from a cable as shown. Pulley $C$ is connected by a short link to block $E$, which rests on a horizontal rail. Knowing that the coefficient of static friction between block $E$ and the rail is 0.30, and neglecting the weight of block $E$ and the friction in the pulleys, determine the maximum allowable value of $\theta$ if the system is to remain in equilibrium.

![Diagram of the system](image1)

**Fig. 1.**

(15分)

2. Determine the $x$ and $z$ components of reaction at the journal bearing $A$ and the tension in cords $BC$ and $BD$ necessary for equilibrium of the rod.

![Diagram of the rod](image2)

**Prob. 2.**

$F_1 = (-800 \text{kN})$

$F_2 = (350 \text{j}) \text{N}$

(15分)
3. The uniform plank having a weight $W$ and length $l$ is supported at its ends $A$ and $B$, where the coefficient of static friction is $\mu$, Fig. 8-11a. Determine the greatest angle $\theta$ so the plank does not slip. Neglect the thickness of the plank for the calculation.

4. An airplane used to drop water on brushfires is flying horizontally in a straight line at $315$ km/h at an altitude of $80$ m. Determine the distance $d$ at which the pilot should release the water so that it will hit the fire at $B$.

![Fig. 4.](image)

5. The magnitude and direction of the velocities of two identical frictionless balls before they strike each other are as shown. Assuming $\epsilon = 0.90$, determine the magnitude and direction of the velocity of each ball after the impact.

![image](image)

6. Please use your words to describe: Statics, Dynamics and Mechanics of Materials (at least 100 words) (15分)

7. Please explain: Rigid body, Non-rigid body, and what we need to take into consideration if the object we calculate are one of these. (at least 100 words) (10分)