所有題目均可以用中文或英文作答。

1. (20分) 圖1中的方塊 D 重量為 5 公斤。桿件 AB 與 BC 的重量可以忽略。D 與平面之間的摩擦係數為 μ。試證明若 $\tan\theta > \frac{1}{\mu}$ 則力 P 無法推動 D 在平面上滑動。
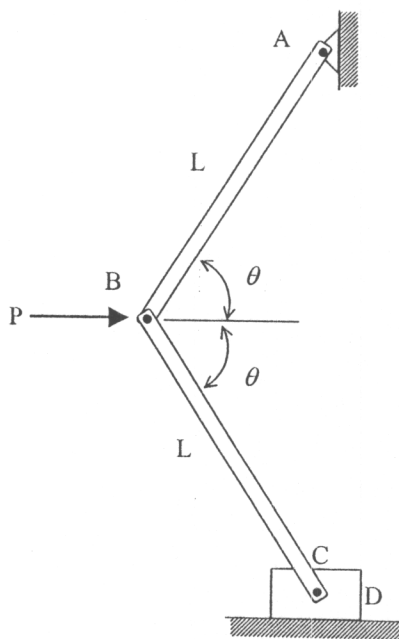

圖 1

2. (20 分) The 90,000-kg jet airliner of Figure 2 is being stopped by brake action only. The engines are at idle and producing negligible thrust. Only the main landing gear is equipped with brakes, and the coefficient of friction between the tires and runway is 0.7. If under these conditions the brakes are applied hard enough that the main wheels are on the verge of slipping, determine the vertical force in the nose wheel strut.
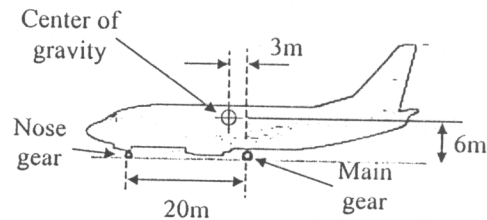

Figure 2

3. (20 分) Determine the distance x in Figure 3 which will cause the reactions at B and C to have equal magnitudes.
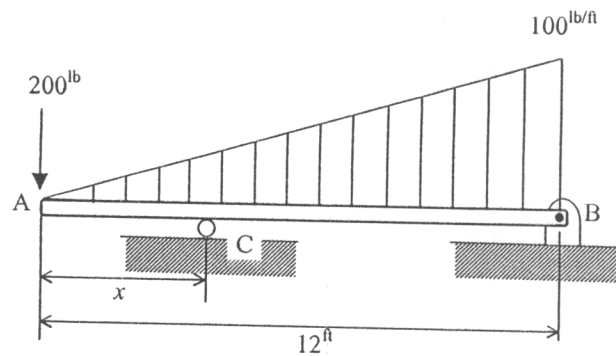

Figure 3

4. (20 分) Determine the forces in members BK, CD, and DK of the pin-connected truss of Figure 4.

Figure 4

5. (20 分) Determine the forces in members AC, BC, DF, and EF of the truss in Figure 5.

Figure 5