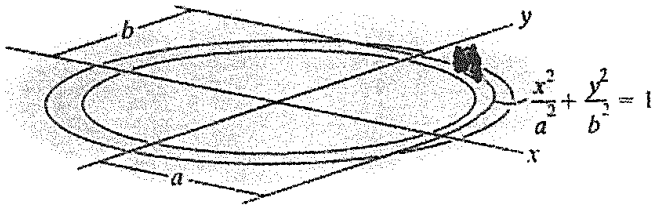
國立臺灣大學 110 學年度碩士班招生考試試題

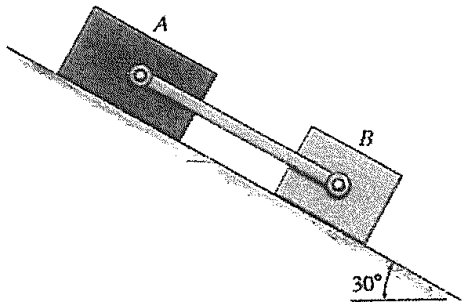
1. (20%)

The motorcycle travels along the elliptical track at a constant speed v. Determine its smallest acceleration if $a > b$.



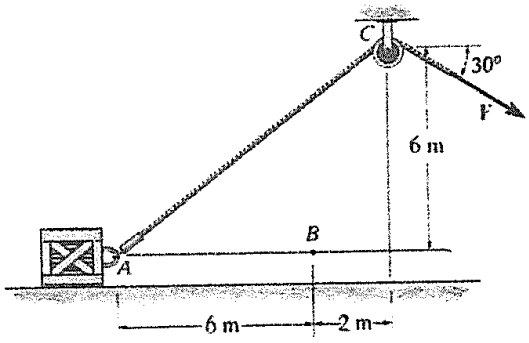
2. (20%)

If blocks A and B of mass 10 kg and 6 kg, respectively, are placed on the inclined plane and released, determine the force developed in the link. The coefficients of kinetic friction between the blocks and the inclined plane are $\mu_A = 0.1$ and $\mu_B = 0.3$. Neglect the mass of the link.



3. (20%)

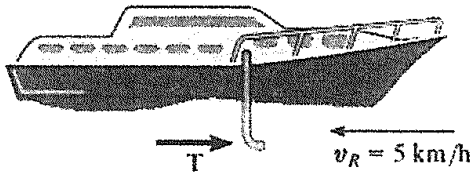
If the 75-kg crate starts from rest at A, determine its speed when it reaches point B. The cable is subjected to a constant force of F=300N. Neglect friction and the size of the pulley.



見背面

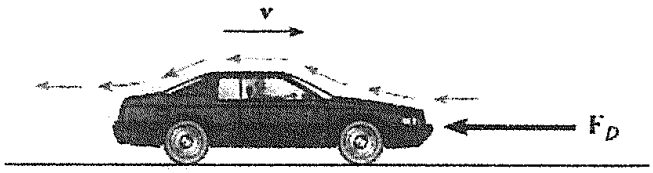
4 (20%)

The boat has a mass of 180 kg and is traveling forward on a river with a constant velocity of 70 km/h, measured relative to the river. The river is flowing in the opposite direction at 5 km/h. If a tube is placed in the water, as shown, and it collects 40 kg of water in the boat in 80 s, determine the horizontal thrust T on the tube that is required to overcome the resistance due to the water collection and yet maintain the constant speed of the boat. ($\rho_w = 1\ \text{Mg/m}^3$)



5 (20%)

A car of mass m is traveling at a slow velocity v_0. If it is subjected to the drag resistance of the wind, which is proportional to its velocity, $F_D = kv$, where k is a known propotional constant. Determine the distance and the time the car will travel before its velocity becomes $0.5v_0$. Assume no other frictional forces act on the car.



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