國立成功大學

110學年度碩士班招生考試試題

編　號：114

系　所：工程科學系

科　目：工程力學

日　期：0203

節　次：第 1 節
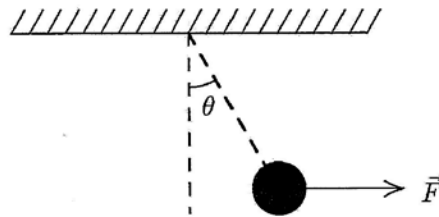
備　註：可使用計算機

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

工程力學共有六題，**請詳細條列**計算或誘導過程。請考生將每題的答案 (若有單位請包含單位) 以**方**

框標註出來，以利批改考卷。

1. (12%)

　(a) A 1-N pendulum bob is held at an angle θ from the vertical by a 2-N horizontal force F as shown. Determine the tension in the string supporting the pendulum bob (in newtons).

　(b) Two forces, one with a magnitude of 3 N and the other with a magnitude of 5 N, are applied to an object. For which orientations of the forces shown in the diagrams is the magnitude of the acceleration of the object the least?
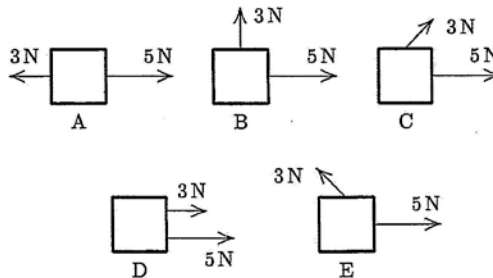
(c) A simple pendulum consists of a 2.0-kg mass attached to a string. It is released from rest at X as shown. Determine its speed at the lowest point Y.
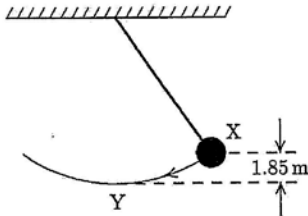

(d) A block of mass m is initially moving to the right on a horizontal frictionless surface at a speed v. It then compresses a spring of spring constant k. At the instant when the kinetic energy of the block is equal to the potential energy of the spring, determine the distance the spring is compressed.

2. (20%) Knowing that the coefficient of static friction between the collar and the rod is 0.3, determine the range of values of T for which equilibrium is maintained.
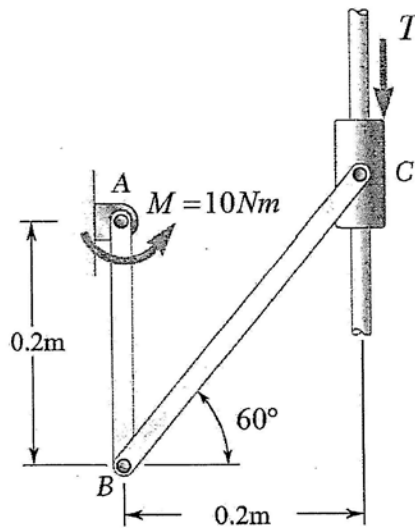
3. (20%) A vertical force T of magnitude $600N$ is applied to the linkage at B. The constant of the spring is $1000N/m$, and the spring is unstretched when AB and BC are horizontal. Neglecting the weight of the linkage, determine θ corresponding to equilibrium.
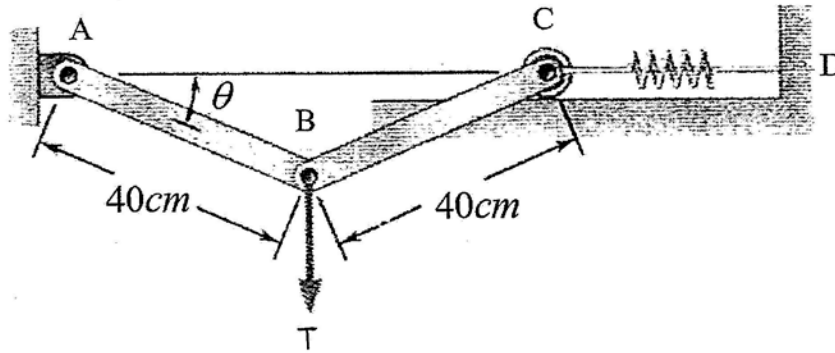
4. (20%) Blocks A and B have masses of 8 kg and 2 kg, respectively, and are connected by a cord-and-pulley system and released from rest in the position shown with the spring undeformed. Knowing that the constant of the spring is 200 N/m, determine (a) the velocity of block B after it has moved 100 mm, (b) the maximum velocity of block B. Ignore friction and the pulleys and spring.
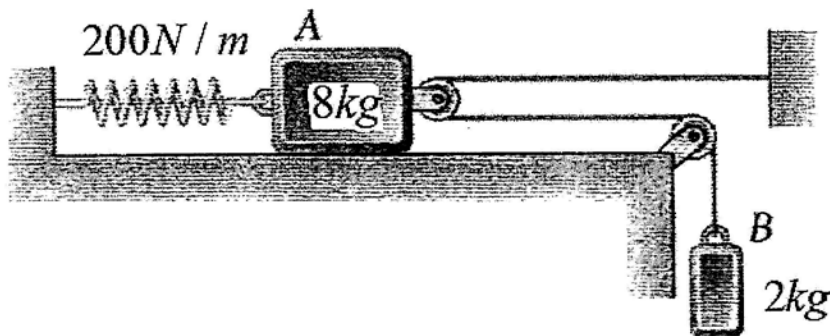
5. (12%) The 5-in.-radius wheel shown rolls to the left with a velocity of 50 in./s. Knowing that the distance *AD* is 3 in., determine the velocity of the collar and the angular velocity of rod *AB* when $\beta = 0$.
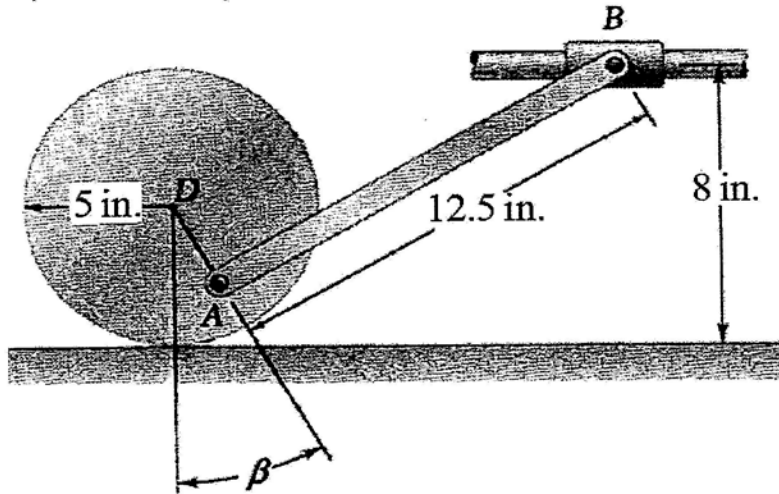
6. (16%) A uniform rod of length *2L* and mass *m* is supported as shown. If the cable attached at end *B* suddenly breaks, determine (a) the acceleration of end *B*, (b) the reaction at the pin support.