※ 考生請注意：本試題 ☑可 ☐不可 使用計算機

1. Collars A and B are connected by a 525 mm long wire and can slide freely on frictionless rods (see Fig. 1). If a force **P**= 341 N**j** is applied to collar A, determine (a) the tension in the wire when y= 155 mm, (b) the magnitude of the force **Q** required to maintain the equilibrium of the system. (20%)

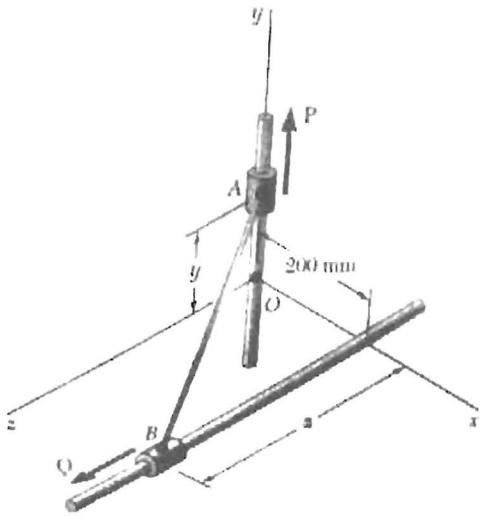

Fig. 1

2. The frame of a greenhouse is constructed from uniform aluminum channels. Locate the center of gravity of the portion of frame shown in Fig. 2. (20%)

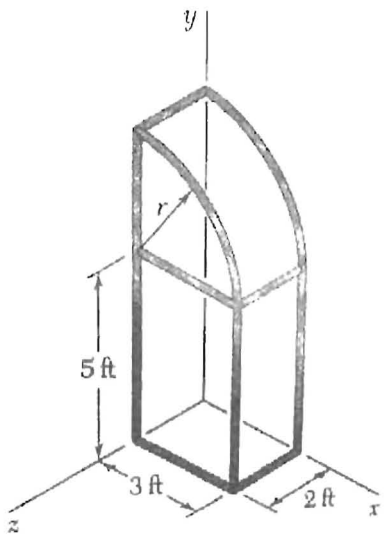

Fig. 2

3. The position of the automobile jack shown is controlled by a screw ABC that is single-threaded at each end (right-handed thread at A, left-handed thread at C, see Fig. 3). Each thread has a pitch of 0.1 in. and a mean diameter of 0.375 in. If the coefficient of static friction is 0.15, determine the

(背面仍有題目,請繼續作答)

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magnitude of the couple M that must be applied to raise the automobile. (20%)

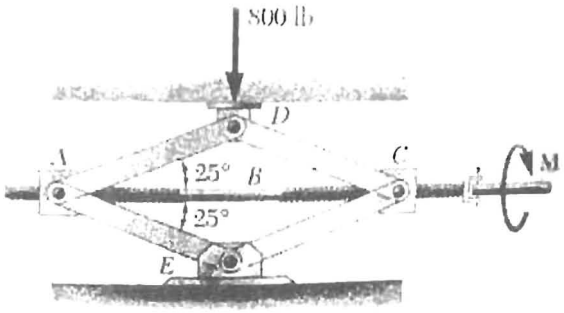

Fig. 3

4. A spring is used to stop a 60-kg package which is sliding on a horizontal surface (see Fig. 4). The spring has a constant k = 20 kN/m and is held by cables so that it is initially compressed 120 mm. Knowing that the package has a velocity of 2.5 m/s in the position shown and that the maximum additional deflection of the spring is 40 mm, determine (a) the coefficient of kinetic friction between the package and the surface, (b) the velocity of the package as it passes again through the position shown. (20%)

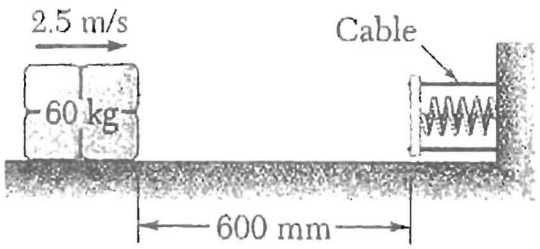

Fig. 4

5. A solid circular bar having diameter d is to be replaced by a rectangular tube having cross-sectional dimensions d × 2d to the median line of the cross section (see Fig. 5). Determine the required thickness t_{min} of the tube so that the maximum shear stress in the tube will not exceed the maximum shear stress in the solid bar. (20%)

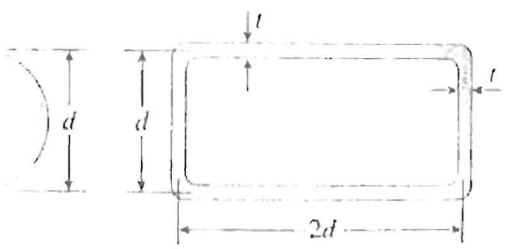

Fig. 5