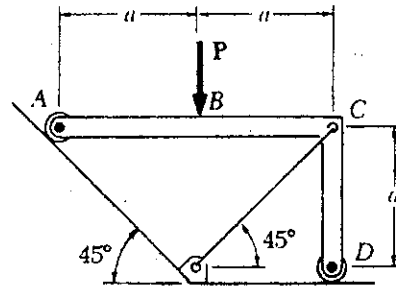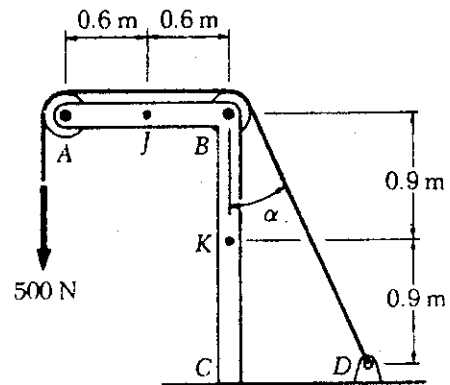本試題是否可以使用計算機：　☑可使用　，　□不可使用　（請命題老師勾選）

1.  (20%) A force **P** is applied to a bent rod
    *ACD* as shown.　Determine the three
    reactions at the supports.

2.  (20%) Knowing that the radius of each
    pulley is 150 mm and that $\alpha = 30°$,
    determine the internal forces (axial force $F$,
    shear force $V$, and bending moment $M$) at
    the cross-sections $J$ and $K$.

3.  (20%) Given the definitions of $I_x$ (the
    moment of inertia of an area $A$ with respect
    to an axis $x$) and $J_o$ (the polar moment of
    inertia of an area $A$ with respect to a point
    $O$),

    $$I_x = \int y^2 dA$$

    $$J_o = \int r^2 dA$$

    where $y$ is the distance between $dA$ and
    $x$-axis, and $r$ is the distance between $dA$
    and the point $O$.　Please derive the
    following formula for a rectngle as shown.
    ($C$ is the center of gravity of the rectangle.)
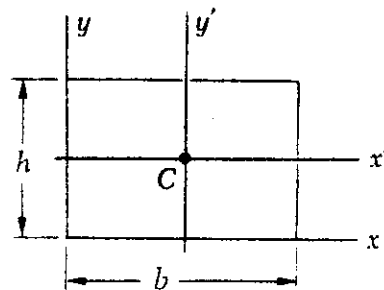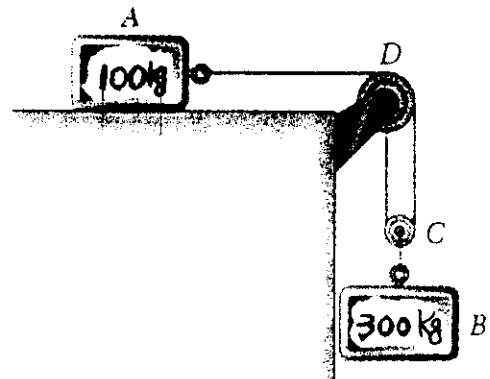
    $$I_{x'} = \frac{bh^3}{12}$$

    $$I_x = \frac{bh^3}{3}$$

    $$J_C = \frac{bh}{12}(b^2 + h^2)$$　　（背面仍有題目,請繼續作答）

本試題是否可以使用計算機： ☑可使用 ， □不可使用   （請命題老師勾選）

4. (20%) The two blocks shown start from rest.   Block $A$ has mass 100 kg and block $B$ has mass 300 kg.   The horizontal plane and the pulley are frictionless, and the pulley is assumed to be of negligible mass. Determine the acceleration of each block and the tension in each cord.

5. (20%) A 30-lb slender rod $AB$ is 5 ft long and is pivoted about a point $O$ which is 1 ft from end $B$.   The other end is pressed against a spring of constant $k = 1800$ lb/in. until the spring is compressed 1 in.   The rod is then in a horizontal position.   If the rod is released from this position (and the rod is free to rotate about $O$), determine its angular velocity and the reaction at the pivot $O$ as the rod passes through a vertical position.