

國立成功大學
110學年度碩士班招生考試試題

編 號： 131

系 所： 航空太空工程學系

科 目： 工程力學

日 期： 0202

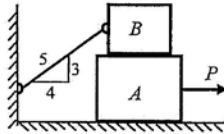
節 次： 第 2 節

備 註： 不可使用計算機

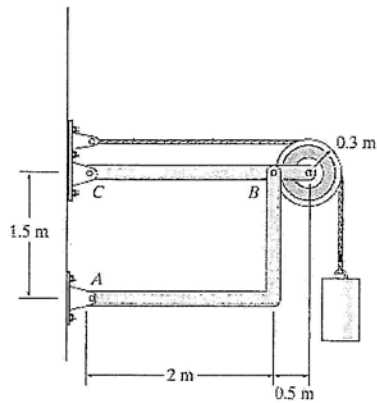
※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. The weights of blocks A and B are, respectively, $W_A = 400\text{ N}$ and $W_B = 340\text{ N}$. Block B is held to a wall by a cable. The coefficient of static friction at all surfaces of contact is 0.2.

- (a) (10%) Draw the free-body diagrams of block A and of block B .
 (b) (10%) Determine the force P needed to move block A .



2. (20%) Determine the horizontal and vertical components of force at pins B and C . The suspended cylinder has a weight of 240 N. The pulley is frictionless, and the weights of members AB and BC are neglected. Hint: identify if there is any two-force member.

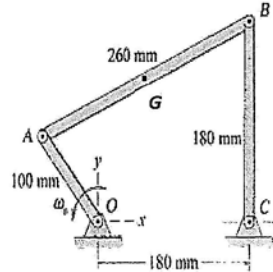


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3. (10%) In the four-bar linkage shown, the control link OA has a counter-clockwise constant angular velocity $\omega_0 = 1 \text{ rad/s}$.

At the instant when point A is on coordinates $(-60, 80)$, link BC is vertical, and link AB is 22.6° from the horizontal, $\cos(22.6^\circ) = 0.923$ and $\sin(22.6^\circ) = 0.385$, calculate

- (1) the angular velocity of link AB ,
- (2) the angular acceleration of AB , and
- (3) the velocity of point G at the midpoint of AB .



4. Continue on the four-bar linkage shown above in gravitation field ($-y$ direction) with a torque applied M on the control link OA . Assume all links are uniform with mass center located at each of the midpoint. Link OA , AB , and BC each has mass m_1 , m_2 , and m_3 , mass moment of inertia I_1 , I_2 , and I_3 .

- (1) Draw the free body diagram of each link and denote all the reaction forces. (9%)
- (2) Write the equation of motion governing the rigid body motion of each link. (9%)
- (3) Specify the unknowns in the equations of (2). How many unknowns? (5%)
- (4) State (no derivation) the extra equations needed in order to solve for all the unknowns. (7%)

5. The rectangular plate of uniform small thickness with mass m kg is welded at θ angle ($\theta = 45^\circ$, the angle between the z -axis and the plate plane) to the midpoint of a vertical shaft of negligible mass and length L rotating at constant angular velocity ω rad/s. Determine

- (1) the mass moment inertia about x - y - z coordinates of the plate, (5%)
- (2) the angular momentum H of the plate about x - y - z coordinates, (5%)
- (3) the kinetic energy of the plate, (5%)
- (4) the moment M applied to the shaft due to dynamic imbalance (5%)

