

國立中山大學 107 學年度碩士暨碩士專班招生考試試題

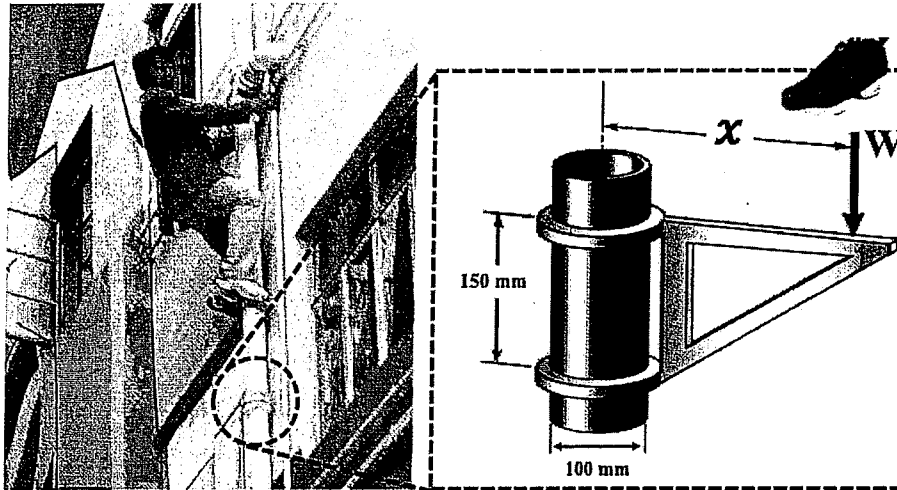
科目名稱：應用力學(含靜力學及動力學)【機電系碩士班乙組】

題號：438008

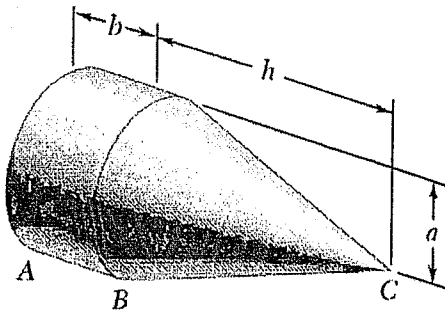
※本科目依簡章規定「可以」使用計算機(廠牌、功能不拘)(問答申論題)

共 3 頁第 1 頁

Q1. Jacky Chen would like to rescue his friend and has to enter the house via the window. He needs to safely stand on a movable bracket, as shown in Fig, firstly. So could you please **determine the minimum distance x** at which the load can be supported for his weight W ? The movable bracket is placed on the 100-mm diameter pipe. The coefficient of friction between the pipe and bracket is 0.25 and the weight of the bracket can be neglected. (15%)

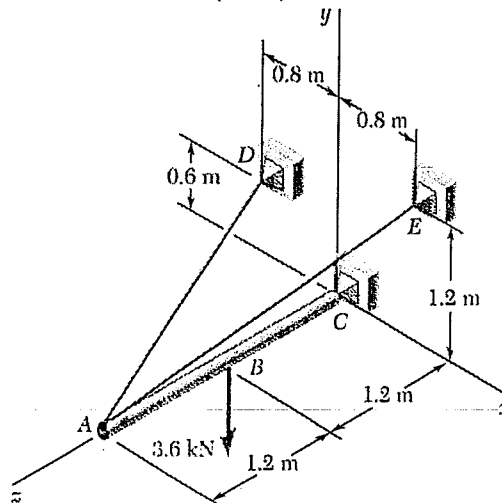


Q2. Please **determine the location of the centroid of the composite body.** (15%)



	V	\bar{x}	$\bar{x}V$
Cylinder I		$\frac{1}{2}b$	
Cone II	$\frac{1}{3}\pi a^2 h$		

Q3. A 2.4-m boom is held by a ball-and-socket joint at C and by two cables AE and AD. **Determine the tension in the cable AE and the reaction at C.** (20%)



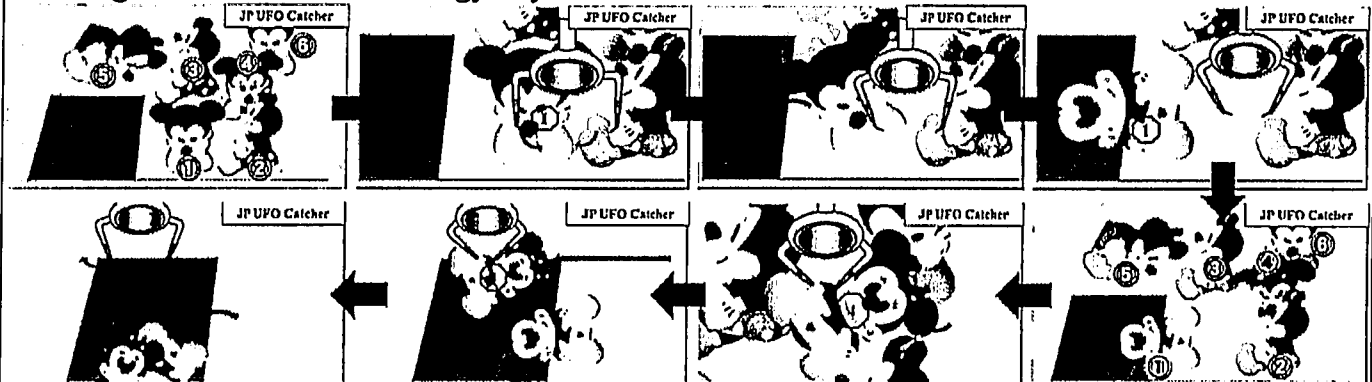
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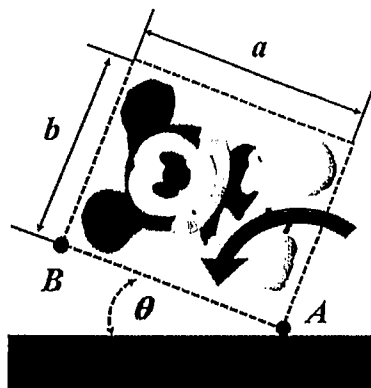
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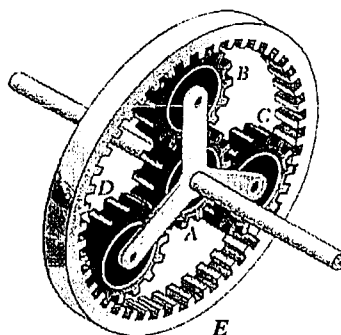
Q4. You are a team member to participate in the International UFO Catcher Competition 2018 in Japan. You have to get the Minnie and Mickey Mouse dolls to win the championship. The following procedures in the figure below show the strategy of your team.



Assuming the Mickey Mouse doll is a uniformly loaded rectangular box and released from rest in the position as shown below. The surface of the table is sufficiently rough to prevent slipping in the Mickey Mouse. Please **determine (a) the smallest value of the ratio a/b of the Mickey Mouse for which point A will remain in contact with the table.** (Hint; Assuming the impact at B is perfectly soft contact and Mickey is fully laid down on a full table. At that instant, the velocities must be zero and the reaction at corner A must be zero. Please use the principle of impulse and momentum to calculate the smallest value of the ratio a/b .) (15%)



Q5. In the planetary gear system shown, the radius of gears A, B, C, and D is 30 mm and the radius of the outer gear E is 90 mm. Knowing that gear E has an angular velocity of 180 rpm clockwise and that the central gear A has an angular velocity of 240 rpm clockwise, **determine the angular velocity of the spider connecting the planetary gears.** (20%)



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Q6. In a game of pool, ball A is moving with a velocity V_0 when it strikes balls B and C, which are at rest and aligned as shown. Knowing that after the collision the three balls move in the directions indicated, and that $V_0 = 7 \text{ m/s}$ and $V_C = 3 \text{ m/s}$, determine the magnitude of the velocity of ball B. (15%)

