

# 國立中山大學 109 學年度 碩士暨碩士專班招生考試試題

科目名稱：動力學【機電系碩士班丁組】

## — 作答注意事項 —

考試時間：100 分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示，可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，不得另攜帶紙張，請衡酌作答。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，其後果由考生自行負擔。
- 答案卷（卡）應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）入場。
- 試題及答案卷（卡）請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

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科目名稱：動力學【機電系碩士班丁組】

題號：438007

※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 2 頁第 1 頁

1. A connecting rod is supported by a knife-edge at Point  $A$ , as shown in Figure 1. For small oscillations, the angular acceleration of the connecting rod is governed by the relation  $\alpha = -5\theta$  where  $\alpha$  is expressed in  $\text{rad/s}^2$  and  $\theta$  in radians. Knowing that the connecting rod is released from rest when  $\theta = 20^\circ$ , determine (a) the maximum angular velocity, (b) the angular position when  $t = 3\text{ s}$ . (20%)

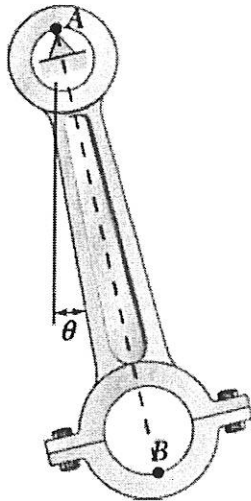


Figure 1

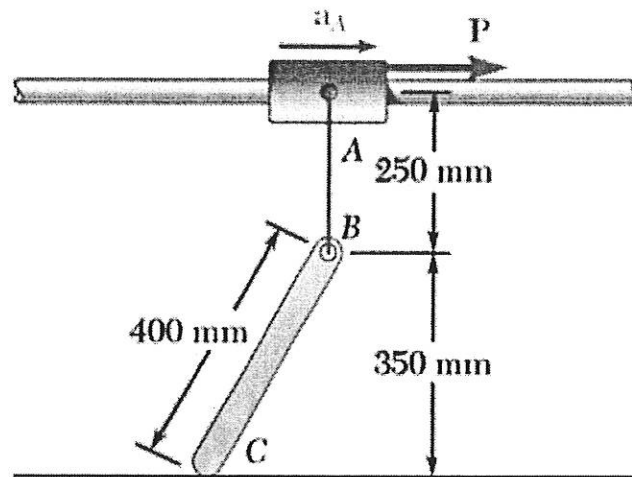


Figure 2

2. A uniform rod  $BC$  of mass  $5\text{ kg}$  is connected to a collar  $A$  by a  $250\text{-mm}$  cord  $AB$ , as shown in Figure 2. Neglecting the mass of the collar and cord, determine (a) the smallest constant acceleration  $a_A$  for which the cord and the rod lie in a straight line, (b) the corresponding tension in the cord. (20%)
3. A  $2\text{ kg}$  model rocket is launched vertically from rest with a constant thrust of  $50\text{ N}$  until the rocket reaches an altitude of  $20\text{ m}$  and the thrust ends. Neglecting air resistance, determine (a) the speed of the rocket when the thrust ends, (b) the maximum height reached by the rocket, (c) the speed of the rocket when it returns to the ground. (20%)
4. A hockey player hits a puck so that it comes to rest in  $10\text{ s}$  after sliding  $50\text{ m}$  on the ice. Determine (a) the initial velocity of the puck, (b) the coefficient of friction between the puck and the ice. (20%)
5. Packages in an automobile parts supply house are transported to the loading dock by pushing them along on a roller track with very little friction, as shown in Figure 3. At the instant shown, packages  $B$  and  $C$  are at rest and package  $A$  has a velocity of  $2\text{ m/s}$ . Knowing that the coefficient of restitution between the packages is  $0.5$ , determine (a) the velocity of package  $C$  after  $A$  hits  $B$  and  $B$  hits  $C$ , (b) the velocity of  $A$  after it hits  $B$  for the second time. (20%)

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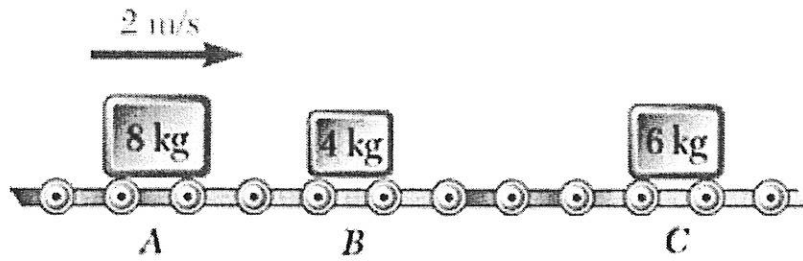


Figure 3