國立中山大學111學年度
碩士班暨碩士在職專班招生考試試題

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，請衡酌作答(不得另攜帶紙張)。
- 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，後果由考生自負。
- 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。**

國立中山大學 111 學年度碩士班暨碩士在職專班招生考試試題

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. The acceleration of a particle is defined by the relation $a = kt^2$. (a) Knowing that $v = -8$ m/s when $t = 0$ s and that $v = +8$ m/s when $t = 2$ s, determine the **constant** k. (b) Write the **equations of motion** [i.e., $x(t)$], knowing also that $x = 0$ when $t = 2$ s. (20%)

2. As shown in Figure 1, the crane shown rotates at the constant rate $\omega_1 = 0.5$ rad/s; simultaneously, the telescoping boom is being lowered at the constant rate $\omega_2 = 0.20$ rad/s. Knowing that at the instant shown the length of the boom is 6 m and is increasing at the constant rate $u = 0.5$ m/s. Determine the **velocity** and **acceleration** of Point B. (20%)

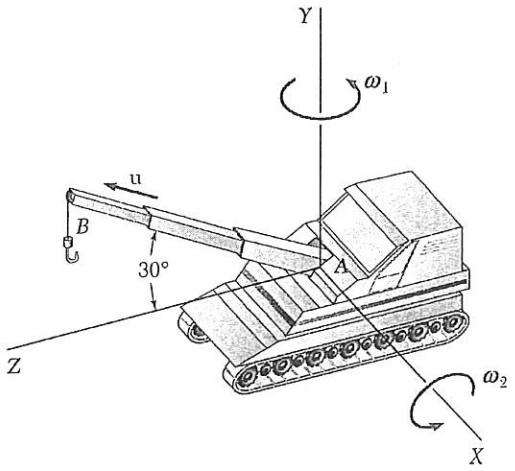

Figure 1.

3. As shown in Figure 2, each of the gears A and B has a mass of 12 kg and has a radius of gyration of 250 mm; gear C has a mass of 3 kg and has a radius of gyration of 100 mm. If a couple **M** of constant magnitude 10 N-m applied to gear C, determine (a) the **angular acceleration** of gear A, (b) the **tangential force** which gear C exerts on gear A. (20%)

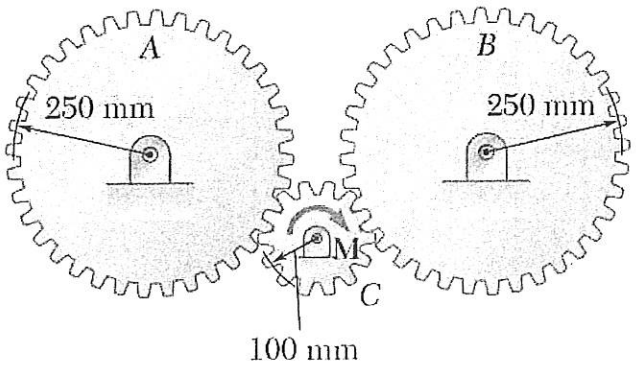

Figure 2.

4. As shown in Figure 3, the catcher arm has a mass of 10 kg and is 2.4 m long (you can model it as a slender rod); the net that catches the drone at B has a negligible mass. The 1.5 kg drone has a mass moment of inertia about its own center of mass of 0.015 kg·m^2. Knowing that the arm swings to an angle of 45° below horizontal, determine (a) the **initial velocity** v_o of the drone, (b) the **forces** at A at that angle. (20%)

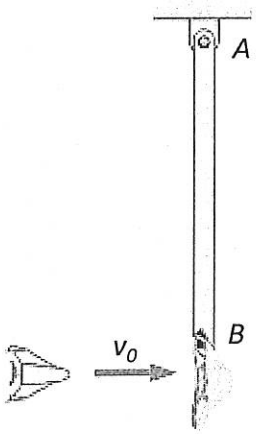

Figure 3.

5. As shown in Figure 4, the uniform 100-kg beam AB is hanging initially at rest with $\theta = 0$ when the constant force $P = 300$ N is applied to the cable. Determine (a) the **maximum angular velocity** reached by the beam with the corresponding angle θ and (b) the **maximum angle** θ_{max} reached by the beam. (20%)

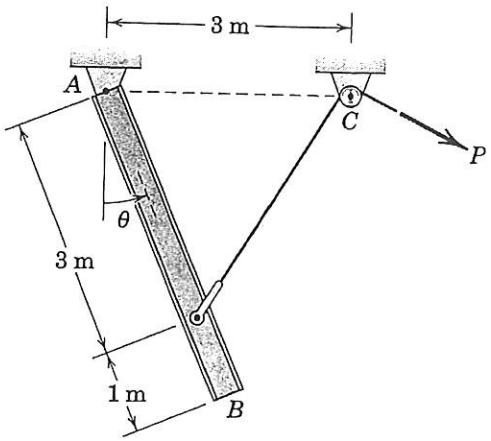

Figure 4.