


**注意：考試開始鈴響前，不得翻閱試題，
並不得書寫、畫記、作答。**

國立清華大學 108 學年度碩士班考試入學試題

系所班組別：動力機械工程學系 丙組

考試科目(代碼)：工程力學(含材力、靜力、
動力)(1301)

— 作答注意事項 —

1. 請核對答案卷(卡)上之准考證號、科目名稱是否正確。
2. 作答中如有發現試題印刷不清，得舉手請監試人員處理，但不得要求解釋題意。
3. 考生限在答案卷上標記「由此開始作答」區內作答，且不可書寫姓名、准考證號或與作答無關之其他文字或符號。
4. 答案卷用盡不得要求加頁。
5. 答案卷可用任何書寫工具作答，惟為方便閱卷辨識，請儘量使用藍色或黑色書寫；答案卡限用 2B 鉛筆畫記；如畫記不清(含未依範例畫記)致光學閱讀機無法辨識答案者，其後果一律由考生自行負責。
6. 其他應考規則、違規處理及扣分方式，請自行詳閱准考證明上「國立清華大學試場規則及違規處理辦法」，無法因本試題封面作答注意事項中未列明而稱未知悉。

國立清華大學 108 學年度碩士班考試入學試題

系所班組別：動機系 丙組

考試科目 (代碼)：工程力學 (1301)

共 4 頁，第 1 頁 *請在【答案卷、卡】作答

1. A timber frame or truss as shown in Fig. 1(a) supports a load P of 50kN. Please find normal internal forces at the mid-point of all members. You may want to start analysing the system using the system-level free-body diagram as shown in figure (b) for reaction loads A_x , A_y , and C_y and force balance scheme as shown in figure (c). As indicated in figure (b), the frame is free to move in horizontal direction. (25%)

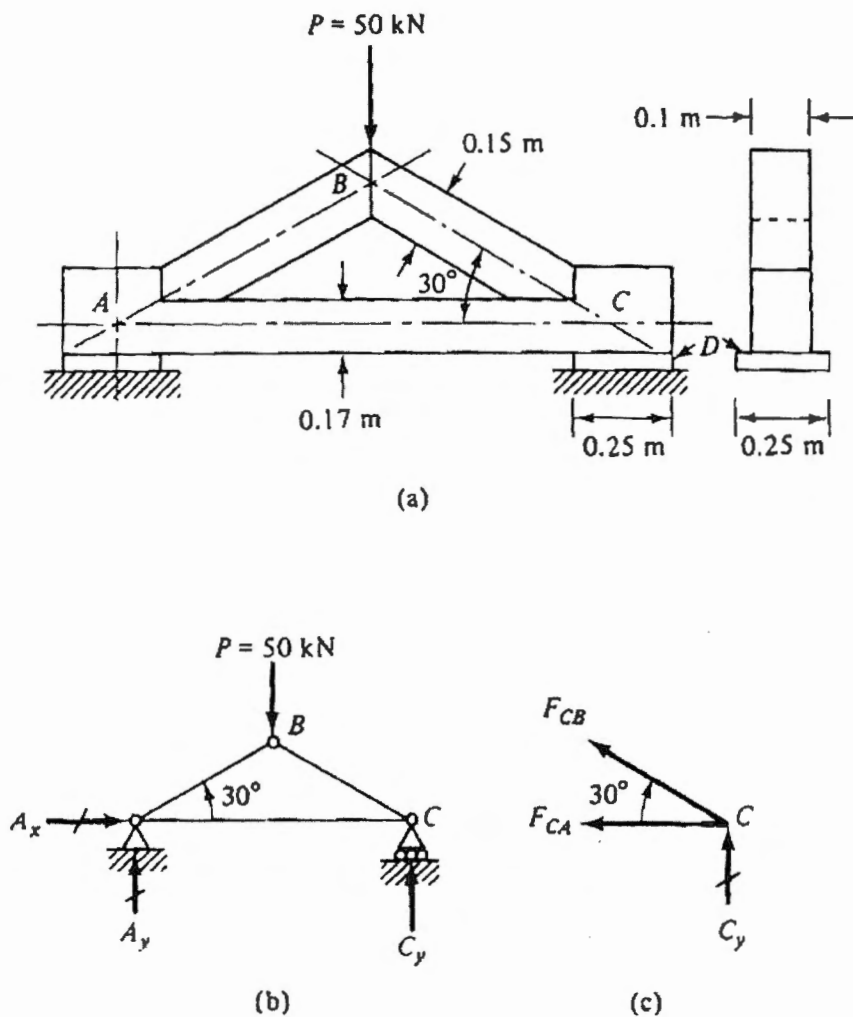


Fig. 1

國立清華大學 108 學年度碩士班考試入學試題

系所班組別：動機系 丙組

考試科目（代碼）：工程力學 (1301)

共 4 頁，第 2 頁 *請在【答案卷、卡】作答

2. As shown in Fig. 2, the coefficients of static and kinetic friction between the drum and brake bar are $\mu_s=0.4$ and $\mu_k=0.3$, respectively. If $M = 50\text{N}\cdot\text{m}$ and $P = 85\text{ N}$, determine the horizontal and vertical components of reaction at the pin O. Neglect the weight and thickness of the brake. The drum has a mass of 25 kg. (25%)

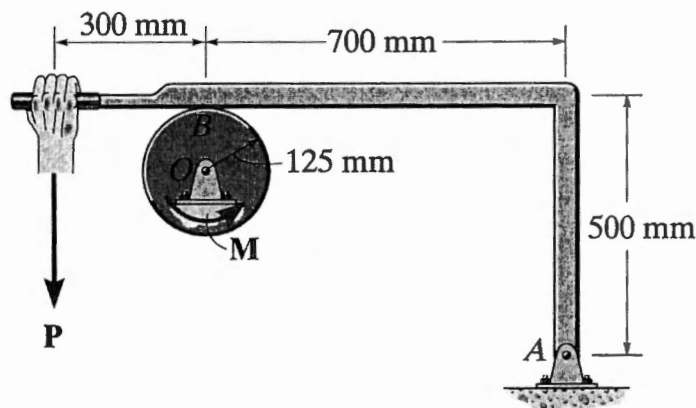


Fig. 2

3. The bag A, having a mass of 10 kg, is released from rest at the position $\theta = 0^\circ$, as shown in Fig. 3. After falling to $\theta = 90^\circ$, it strikes a 15-kg box B. If the coefficient of restitution between the bag and box is $e = 0.4$, determine the velocities of the bag and box just after impact and the loss of energy during collision. (25%)

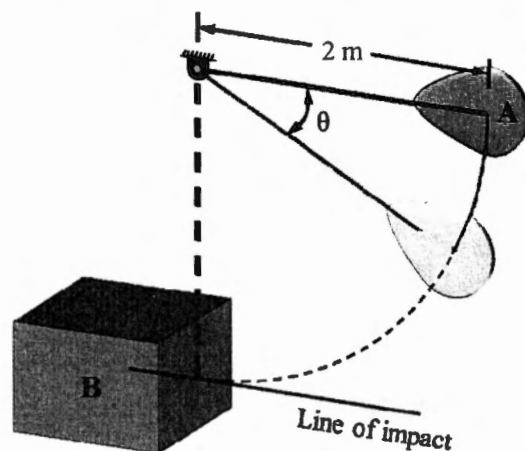


Fig. 3

國立清華大學 108 學年度碩士班考試入學試題

系所班組別：動機系 丙組

考試科目（代碼）：工程力學 (1301)

共 4 頁，第 3 頁 *請在【答案卷、卡】作答

4. The spool in Fig. 4. has a mass of 10 kg and a radius of gyration of $k_G = 1.5$ m. If cords of negligible mass are wrapped around its inner hub and outer rim as shown, determine the spool's angular acceleration. (25%)

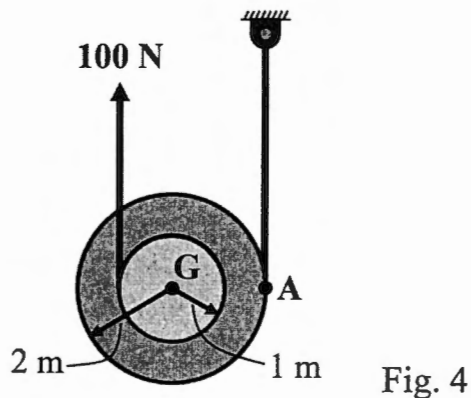


Fig. 4

5. The motor A as shown in Fig. 5 develops a power of 300W and turns its connected pulley at 90 rev/min. The power is transmitted to 150 mm radius pulley through belt and small 60 mm radius pulley.
- 1) What is the equivalent radian per second for 90 rev/min? (5%)
 - 2) Determine the required diameters of the steel shafts on the pulleys at A if the allowable shear stress is $\tau_{\text{allow}} = 100$ MPa. (10%)
 - 3) Determine the required diameters of the steel shafts on the pulleys at B if the allowable shear stress is $\tau_{\text{allow}} = 100$ MPa. (10%)

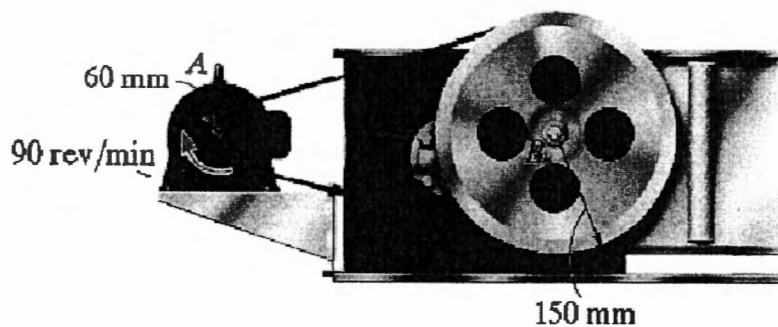


Fig. 5

國立清華大學 108 學年度碩士班考試入學試題

系所班組別：動機系 丙組

考試科目（代碼）：工程力學 (1301)

共 4 頁，第 4 頁 *請在【答案卷、卡】作答

6. As shown in Fig. 6, the thin-walled pipe has an inner diameter of 0.5 in. and a thickness of 0.025 in. If it is subjected to an internal pressure of 500 psi and the axial tension and torsional loadings shown, determine the principal stresses and the absolute maximum shear stress at a point on the surface of the pipe. (25%)

NOTE: MOHR'S CIRCLE MUST BE USED TO SOLVE THE PROBLEM.

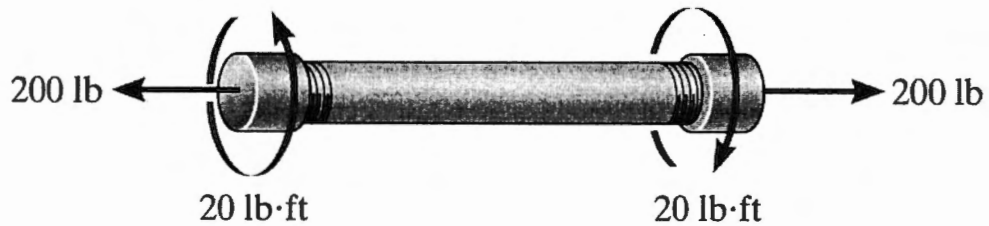


Fig. 6