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 115 學年度碩士班考試入學試題

系所班組別：經濟學系

科目代碼：4701

考試科目：個體經濟學

—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. 考試開始後，請於作答前先翻閱整份試題，是否有污損或試題印刷不清，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. 提早交卷者不可攜出試題，請將試題連同答案卷(卡)交予監考人員，攜出將以違規論處。當節考試結束後試題將置於講台，可自行取回，本試場不負保管責任。
7. 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。

1. A consumer has the quasi-linear utility function $U(q_1, q_2) = 12\sqrt{q_1} + q_2$, where good 2 is the numeraire with price $p_2 = 1$. Initially, the price of good 1 is $p_1 = 9$ and the consumer's income is $Y = 8$. Then the price of good 1 falls from $p_1 = 9$ to $p_1' = 2$, while p_2 and Y remain unchanged.
   a. Derive the marginal rate of substitution of good 1 for good 2. (2 points)
   b. Derive the indirect utility function $v(p_1, Y)$ for this consumer, and evaluate it at $(p_1, Y) = (9, 8)$ and $(p_1', Y) = (2, 8)$. (8 points)
   c. Compute the compensating variation (CV) and the equivalent variation (EV) for this price change. (6 points)
   d. Are CV and EV equal in this case? Explain briefly why or why not. (4 points)

2. Suppose that there are 80 competitive firms in a market. Each firm has the short-run cost function $C(q) = 25 + 10q + q^2$, where q is the firm's output, $q \geq 0$. The price of the good is p.
   a. Find the firm's shutdown price and derive the firm's short-run supply. (4 points)
   b. Suppose the market demand curve is $Q^D = 800 - 20p$, where Q is total market quantity. Find the short-run competitive equilibrium price and quantity. (4 points)
   c. Now suppose this cost function also describes firms' long-run costs and that there is free entry and exit in the industry. For a representative firm, find the output level q^{LR} that minimizes AC. (4 points)
   d. Suppose the corresponding price p^{LR} implies long-run zero-profit conditions. Using the demand curve $Q^D = 800 - 20p$ and p^{LR}, find the long-run competitive equilibrium quantity Q^{LR}. (4 points)
   e. How many firms operate in the long run? Compare this to the short-run number of firms (80) and briefly explain the adjustment in terms of entry or exit. (4 points)

3. In a competitive market for coffee, demand and supply are:

$$Q^D = a - bp_c,$$
$$Q^s = dp_s,$$

where p_c is the price paid by consumers, p_s is the price received by sellers, and $a, b, d > 0$. The government imposes an ad valorem tax at rate τ on sellers, so that: $p_c = (1+\tau)p_s$.

   a. Solve for the equilibrium quantity Q^{AV} under the ad valorem tax. (You may give your result directly in terms of a, b, d, τ.) (5 points)

   b. Now suppose instead the government imposes a specific tax t, so that: $p_c = p_s + t$. Find the value of t that makes the specific tax equivalent to the ad valorem tax, meaning: $Q^{SP}(t) = Q^{AV}$. (5 points)

4. A monopolist sells a product with constant marginal cost $c = 2$. There is a representative consumer with inverse demand $p(q) = 18 - 2q, q \geq 0$. The firm adopts a three-block pricing scheme. It chooses three quantity cutoffs $0 < q_1 < q_2 < q_3$, and charges constant per-unit prices, p_1, p_2, and p_3, for each block. A consumer must purchase earlier blocks before purchasing later blocks. Assume that block prices are set so that the consumer is exactly indifferent between purchasing up to each cutoff and not purchasing the next unit: $p_1 = p(q_1), p_2 = p(q_2), p_3 = p(q_3)$. Answer the following questions.

   a. Find the profit-maximizing (q_1, q_2, q_3) and the corresponding (p_1, p_2, p_3). What is the corresponding maximized profit. Please show your calculation process. (10 points)

   b. If the firm is allowed to increase the number of pricing blocks from three to four, explain with economic intuition how each of the following will change (increase, decrease, or remain unchanged), and why: (1) firm profit; (2) consumer surplus; and (3) total welfare (total surplus). (5 points)

5. Consider a homogenous-goods duopoly with inverse demand

$$P = 30 - Q, Q = q_1 + q_2,$$

where q_1 and q_2 are output level for Firm 1 and Firm 2, respectively. Each firm has a constant marginal cost $c_1 = c_2 = 6$. Two firms compete in quantity. Suppose that Firm 1 is the Stackelberg leader and firm 2 is the follower.

a. What is Firm 2's reaction function? Use a graph to show firm 2's reaction function. Solve for the Stackelberg equilibrium and show this equilibrium on the graph for Firm 2's reaction function. Please show your calculation process. (10 points)

b. Compared the result from above with the Cournot equilibrium, briefly state how outputs and profits change under Stackelberg competition without re-solving the Cournot model. Explain the intuition behind these differences. (5 points)

c. Now interpret Firm 1 as a domestic exporter and Firm 2 as a foreign rival. Suppose the two firms initially engage in Cournot competition. The domestic government consider to provides a per-unit export subsidy to Firm 1. How the subsidy affects Firm 1's strategic behavior? How equilibrium outputs for two firms change? You might use reaction functions to briefly explain the intuition behind it without explicit calculation. (5 points)

6. 某一市場中有兩種類型的廠商：高品質廠商（H）與低品質廠商（L）。廠商知道自身產品品質，但消費者在購買前無法直接觀察品質。產品可以搭配不同長度的保固(warranty)銷售。假設提供較長保固對高品質廠商而言成本較低，而對低品質廠商而言成本較高。

a. 請說明為何「保固長度」可以作為一種可信的品質訊號（signal）。你的說明需明確提及成本結構與誘因。(5 points)

b. 假設市場出現一個 separating equilibrium：高品質廠商提供長保固，低品質廠商提供短保固。請說明此均衡必須滿足哪些基本條件（以文字說明，不需數學式）。(5 points)

c. 請說明為何上述 separating equilibrium 通常不是第一最佳（first-best）。請從效率損失或扭曲的決策角度說明，並指出主要是由哪一類型的廠商承擔這個代價。(5 points)