※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (15%) Consider a market with demand function as $Q = P^\varepsilon$ where $\varepsilon < -1$.

   a. Suppose a monopoly produces in this market with a total cost function as $C(Q) = cQ$. Show that the tax incidence can go for more than 100% so that \$1 increase in the specific tax can cause more than \$1 increase in the market price. (10%)

   b. Discuss whether the tax incidence can go for more than 100% if the market is under perfect competition with each firm facing increasing marginal cost. (5%)

2. (10%) Suppose the preference of a consumer when consuming good X and Y in amount (x, y) could be either $u(x,y) = x^2 y$, $v(x,y) = x^2 + y$; $w(x,y) = \min(x^2, y)$; or $z(x,y) = xy$. From observations, suppose she prefers $(5, 5)$ over $(4, 4)$, $(2, 3)$ over $(3, 1)$, $(3, 7)$ over $(5, 4)$, and $(7, 4)$ over $(3, 9)$. Explain which one out of u, v, w and z is more likely to be the consumer's utility function.

3. (15%) Consider a department store that acts as a monopoly facing annual market divided equally into two identical periods. Assume its total cost function is $C(Q) = cQ$ so the constant marginal cost is c. The market demand in each period is $Q = a - P$ so the monopoly sells to the same market for two consecutive periods each year.

   Suppose a marketing company offers a tactic to transform the markets into two isolate ones with demands changed to $Q = a - (1 + b)P$ and $Q = a - (1 - b)P$ respectively so that the total market size remains the same but the monopoly can now price discriminate between the two with the term called "anniversary sale". How much at most will the department store be willing to pay for the marketing tactic?

4. (15%) Suppose commodities of a monopoly can be produced by paying \$5 per unit when using a bigger machine or \$10 when using a smaller one. In addition, the monopoly has to pay annual rent either \$1,000 for the bigger machine or \$500 for the smaller one, depending on which machine it uses.

   a. Derive the firm's annual average cost function. (7%)

   b. Suppose the monopoly faces the demand as $Q = 200 - 2P$, find its maximized profit. (8%)

5. (15%) Consider an industry with m leading firms and n following firms. Suppose they engage in quantity competition so that the following firms will first observe simultaneous quantity choices of the leading firms and then make their decisions afterwards. Assume the inverse demand is $P = a - Q$ where Q is the industrial output produced collectively by all $m + n$ firms. Moreover, all firms produce with the same total cost function as $C(Q) = cQ$.

   a. Find the equilibrium price in this market. (10%)

   b. Imagine a market with the same number of leading and following firms. Verify whether the market will be more competitive if there's an increase in the number of leading firms or following firms. (5%)

6. (15%)Consider a worker with preference for daily consumption and leisure as $u(N, Y) = N^2 Y$ when having leisure time for N hours while consuming goods of value $\$Y$. Suppose each worker has 24 hours a day to spend on either leisure or work L from which she expects to earn $w = \$1$ per hour to use fully on her consumption.

   a. Derive the equilibrium labor hours L. (5%)

   b. If the government sets the maximum working hours to 4 hours under the new labor law but the government gives a lump sum transfer to workers to keep their welfare unchanged. How much at least should be given to the workers? (5%)

   c. Instead of lump sum transfer, suppose the government subsidies the workers $\$s$ per hour so the latter receive $\$1 + s$ per hour from their work after the new regulation. How much should $\$s$ be set so that the workers' welfare is unchanged? In which case, lump sum transfer or subsidy, will the government spend less money? (5%)

7. (15%) Suppose the estimated annual market demand for a product is $Q = 440 - 10P$. Each potential or incumbent producer can produce with identical cost function, $C(q) = 2q^2 + 4q + 50$ when producing q units. The market is considered perfectly competitive.

   a. Originally the market is in LR equilibrium. Find its equilibrium price. (5%)

   b. Suppose the market has experienced a permanent decrease in demand so the new demand becomes $Q = 360 - 10P$. Find the short-run equilibrium after the impact. (5%)

   c. Find the new long-run equilibrium after the decrease in demand. (5%)