HE1001 Microeconomics

Final Examination – Problems & Solutions

Academic Year 2025/2026, Semester 1

Compiled and typeset by QRS

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Reconstructed from memory only — not an official exam paper or answer key.

Instructions:

- This reconstructed examination contains **4 questions** worth a total of **100 marks**:
  - Question 1: 20 marks
  - Question 2: 40 marks
  - Question 3: 20 marks
  - Question 4: 20 marks
- This practice examination contains **3 questions** worth a total of **100 marks**.
- Answer **all questions**.
- Show all working clearly. Partial credit may be awarded for correct methods.
- Write your answers in the spaces provided or on additional paper as needed.
- Calculators are permitted.
- Time: 2 hours.

Question 1 — Multiple Choice Questions (20 marks)

1.1 A non-refundable concert ticket costs \$80. On the day of the concert, you are offered a part-time job that pays \$100, but you would need to spend \$20 on transport to take the job. Consider the following statements:

(A) The \$80 concert ticket is a sunk cost.

(B) The \$100 from the part-time job is an implicit cost of attending the concert.

(C) The \$20 transport cost is an explicit cost.

(D) The economic cost of attending the concert is \$120.

(E) All of the above statements are correct.

Correct answer: (E).

Solution: The \$80 ticket is non-refundable and already paid ⇒ sunk cost. If you attend the concert, you give up \$100 wages ⇒ implicit (opportunity) cost. Transport \$20 is a direct money outlay ⇒ explicit cost. Economic cost of attending now = \$100 (foregone wage) + \$20 (transport) = \$120, so all four statements are true.

1.2 Which of the following statements about an Engel curve is correct?

(A) An Engel curve shows combinations of income and prices.

(B) An Engel curve can be positively or negatively sloped.

(C) An Engel curve shows combinations of income and quantity demanded of a good.

(D) An Engel curve is always positively sloped.

(E) Both B and C are correct.

(F) Both C and D are correct.

(G) Both A and B are correct.

(H) Both A and C are correct.

Correct answer: (E).

Solution: Engel curves relate income (on one axis) to quantity demanded (on the other) for a given good, holding prices fixed. Normal goods ⇒ upward-sloping Engel curve; inferior goods ⇒ downward-sloping. Thus B and C are true; A and D are false.

1.3 Suppose the U.S. demand curve for gasoline shifts rightward while the U.S. supply curve for gasoline remains unchanged. As a result, the price of gasoline increases by 9%, and the equilibrium quantity increases by 3%. Which of the following is true based on this information?

(A) The price elasticity of supply for gasoline is roughly 3.

(B) The price elasticity of supply for gasoline is roughly 0.33.

(C) The price elasticity of demand for gasoline is roughly 0.33.

(D) The price elasticity of demand for gasoline is roughly -3.

Correct answer: (B).

Solution: Only supply curve is unchanged $\Rightarrow$ movement along supply.

$$\varepsilon_s \approx \frac{\%\Delta Q}{\%\Delta P} = \frac{3\%}{9\%} = 0.33.$$

1.4 Indifference curves are typically convex to the origin because of:

(A) Transitivity.

(B) Diminishing marginal rate of substitution (MRS).

(C) Non-satiation.

(D) Completeness.

Correct answer: (B).

Solution: Convexity reflects diminishing MRS: as the consumer has more of good x and less of good y, they are willing to give up fewer units of y for additional units of x. Transitivity and completeness ensure well-behaved preferences; non-satiation explains downward slope.

1.5 Which of the following is a key assumption of a perfectly competitive market?

(A) Firms are price-makers.
(B) Commodities have not many sellers.
(C) It is difficult for new sellers to enter the market.
(D) Each seller has a small share of the market.
(E) Buyers have bargaining power.
(F) Both A and B.
(G) Both A and C.
(H) Both B and D.
(I) A, B, and C.

Correct answer: (D).

Solution: Perfect competition assumes many small firms, each with a negligible share of the market, price-taking behaviour, homogeneous product, and free entry/exit. D is the only correct statement.

1.6 In class, marriage was discussed as an example where one standard preference assumption may fail. Which assumption is most clearly violated in the case of altruistic preferences in marriage?

(A) Completeness.
(B) Non-satiation ("more is better").
(C) Self-interest.
(D) Transitivity.

Correct answer: (D).

1.7 Which of the following is **least likely** for a monopoly?

(A) The monopolist is the sole producer in the market.

(B) Monopoly price is solely determined from the demand curve.

(C) The monopolist can charge as high a price as it likes to maximize its profit.

(D) The monopolist typically faces a downward-sloping demand curve.

(E) All of the above are likely.

Correct answer: (B).

Solution: A and D describe standard monopoly features. Price is determined by *both* demand and cost (via $MR = MC$), not demand alone. Statement C is also misleading, but B is fundamentally wrong as a pricing rule and is taken as the "most unlikely" in this reconstruction.

1.8 For a monopolist, suppose the firm is currently producing at a quantity where $P = MC$. Which statement is correct?

(A) Profit is maximized at this output.

(B) Profit is not maximized; the firm should increase output.

(C) Profit is not maximized; the firm should decrease output.

(D) The firm must be earning positive economic profit at this output.

Correct answer: (C).

Solution: For a monopolist, $MR < P$ along a downward-sloping demand curve. At $P = MC$, we have $MR < P = MC \Rightarrow MR < MC$, so the firm is producing too much relative to its own profit-maximizing quantity and should reduce output until $MR = MC$.

1.9 John loves hamburgers and soft drinks and insists on consuming exactly **1 soft drink for every 2 hamburgers**. His utility function can be expressed as:

$$u(D, H) = ?, \quad \text{where } D \text{ is soft drinks and } H \text{ is hamburgers.}$$

(A) $u(D, H) = D + 2H$

(B) $u(D, H) = D + H$

(C) $u(D, H) = 2D + H$

(D) $u(D, H) = \min(2D, H)$

(E) $u(D, H) = \min(D, H)$

(F) $u(D, H) = \min(D, 2H)$

(G) None of the above.

Correct answer: (D).

Solution: Perfect complements with fixed proportion $H : D = 2 : 1$ have kinks along $H = 2D$. A suitable representation is $u(D, H) = \min(2D, H)$.

1.10 Which of the following statements about Nash equilibrium (NE) and dominant strategy equilibrium (DSE) is correct?

(A) In a Nash equilibrium, each player's strategy is optimal regardless of the opponent's action.

(B) A Nash equilibrium is a set of mutual best responses to each other's actions.

(C) Every Nash equilibrium is also a dominant strategy equilibrium.

(D) All of the above.

Correct answer: (B).

Solution: (A) describes dominant strategies. (B) is the correct definition of Nash equilibrium. (C) is false: every dominant strategy equilibrium is a NE, but not every NE has dominant strategies.

Question 2 — Mutiple Choice Questions with Justifications (40 marks)

2.1 [10 marks]

Sarah quits a job that paid her \$36,000 per year and starts her own business. To finance the business, she uses \$12,000 of her own savings (which could have earned 10% annual interest) and borrows another \$12,000 from a bank at 10% interest. Over the year, her *variable costs* of running the business (wages to staff, materials, etc.) are \$20,000, and her *total revenue* is \$50,000.

Based on the shutdown and exit conditions, which of the following best describes her decision?

(A) She should shut down immediately in the short run.

(B) She should continue in the short run, but (if conditions do not improve) may exit in the long run.

(C) She should continue in both the short run and the long run.

(D) She should exit immediately in both the short and long run.

Correct answer: (B).

Solution.

- *Explicit costs:* Variable cost: \$20,000. Interest on bank loan: $0.10 \times 12{,}000 = \$1{,}200$. Total explicit = \$21,200.
- *Accounting profit:*

$$\pi_{\text{accounting}} = TR - \text{explicit costs} = 50{,}000 - 21{,}200 = \$28{,}800.$$

- *Implicit costs:* Foregone salary: \$36,000. Forgone interest on savings: $0.10 \times 12{,}000 = \$1{,}200$. Total implicit = \$37,200.
- *Economic profit:*

$$\pi_{\text{economic}} = TR - (\text{explicit} + \text{implicit}) = 50{,}000 - (21{,}200 + 37{,}200) = 50{,}000 - 58{,}400 = -\$8{,}400.$$

- *Short-run vs long-run decision:* Shutdown rule (short run): continue if $TR \geq VC$. Here $TR = 50{,}000 > VC = 20{,}000$, so she covers variable costs and contributes to fixed/implicit costs. She should **not** shut down immediately.

  Long run: persistent negative *economic* profit suggests she should exit and return to her best alternative (her previous job plus interest on savings).

  Hence the best description is: **(B)** continue in the short run, but (if nothing changes) exit in the long run.

2.2 [10 marks]

A monopolist produces quantity $Q_m = 10$ and charges price $P_m = 12$. Marginal cost is constant at $MC = 6$. Under perfect competition with the same cost conditions, the equilibrium quantity would be $Q_c = 12$ at price $P_c = 6$.

Assuming the demand curve is linear between these points, what is the deadweight loss (DWL) associated with monopoly?

(A) \$4

(B) \$6

(C) \$8

(D) \$10

(E) \$12

(F) None of the above

Solution.

The DWL is the triangular area between demand and MC over the range where monopoly output is below the efficient output:

$$\text{Base in quantity} = Q_c - Q_m = 12 - 10 = 2,$$

$$\text{Height in price} = P_m - MC = 12 - 6 = 6.$$

$$\text{DWL} = \tfrac{1}{2} \times \text{base} \times \text{height} = \tfrac{1}{2} \times 2 \times 6 = 6.$$

Correct answer: (B).

2.3 [10 marks]

Consider a perfectly competitive firm and a monopolist, each producing at its profit-maximizing output level Q^*. Which of the following statements are correct?

(A) For a competitive firm, if it produces an additional unit beyond Q^*, the increase in total cost exceeds the increase in total revenue.

(B) For a monopolist, if it produces an additional unit beyond Q^*, the increase in total cost exceeds the increase in total revenue.

(C) For both market structures, price equals average revenue (AR) at every quantity.

(D) A and B only.

(E) A and C only.

(F) B and C only.

(G) A, B, and C.

Solution.

At the profit-maximizing quantity, both types of firms satisfy $MR = MC$. For any output *beyond* Q^*, $MC > MR$, so each additional unit reduces profit: this is true for both the competitive firm and the monopolist ⇒ (A) and (B) are true.

Average revenue is defined by

$$AR(Q) = \frac{TR(Q)}{Q} = \frac{P(Q)Q}{Q} = P(Q),$$

so $P = AR$ for both types of firms (even though $P \neq MR$ for the monopolist). Hence (C) is also true.

Correct answer: (G).

2.4 [10 marks]

Consider the Cournot and Stackelberg duopoly models.

(A) In the Stackelberg model, the follower ends up in a better position than the leader.

(B) The strategic choice variable in both Cournot and Stackelberg models is the **quantity (output)** of each firm.

(C) The Stackelberg equilibrium is a **subgame-perfect equilibrium**.

(D) The Cournot equilibrium is a dominant strategy equilibrium and therefore a Nash equilibrium.

(E) A and B only.

(F) B and C only.

(G) B and C and no others.

Solution.

In the standard Stackelberg model with homogeneous products and constant marginal cost, the *leader* typically earns higher profit than the follower, so (A) is false. Both Cournot and Stackelberg are quantity-competition models, so (B) is true. Stackelberg is a sequential game and the solution concept is subgame-perfect equilibrium via backward induction, so (C) is true. The Cournot equilibrium is a Nash equilibrium, but not generally a dominant strategy equilibrium (best responses depend on the other firm's output), so (D) is false.

Thus only B and C are correct.

Correct answer: (F).

Question 3 — Short Answer Questions (20 marks)

3.1 Political advertising game [10 marks]

Two political candidates, A and B, choose among three levels of campaign spending: Low (L), Medium (M), and High (H). The payoffs represent each candidate's share of the popular vote, and in every outcome the shares sum to 100. Candidate A moves first, then candidate B observes A's choice and chooses L, M, or H.

A payoff matrix consistent with the exam's description is:

	B:L	B:M	B:H
A:L	(40, 60)	(30, 70)	(20, 80)
A:M	(60, 40)	(45, 55)	(35, 65)
A:H	(70, 30)	(65, 35)	(50, 50)

In particular, when both choose High, the outcome is $(50, 50)$.

Task: Find the equilibrium of this game, given that A moves first.

Solution.

Because B moves after observing A's choice, we analyse B's optimal response for each possible action of A:

- If A chooses L: B's payoffs are 60 (if B chooses L), 70 (M), and 80 (H). B's best response is H.
- If A chooses M: B's payoffs are 40 (L), 55 (M), and 65 (H). B's best response is H.
- If A chooses H: B's payoffs are 30 (L), 35 (M), and 50 (H). B's best response is again H.

Thus, regardless of A's action, B will choose H. Anticipating this, A compares A's payoff when B chooses H in each case:

$$A(L, H) = 20, \quad A(M, H) = 35, \quad A(H, H) = 50.$$

A obtains the highest payoff by choosing H.

Therefore, the equilibrium of the game (with A moving first) is:

$$\boxed{\text{A chooses H, B chooses H}}$$

with outcome (H, H) and payoffs $(50, 50)$. This outcome is the subgame-perfect equilibrium of the sequential game.

3.2 Market demand from heterogeneous consumers [10 marks]

There are two groups of consumers, G and B, each of size 100.

Group G:

$$U_G(x, y) = 4x^{0.5}y^{0.5}, \qquad m_G = 750.$$

Group B:

$$U_B(x, y) = x^{0.4}y^{0.4}, \qquad m_B = 500.$$

The price of good x is P_x, and the price of good y is $P_y = 50$. Derive the **market demand function for good** x as a function of P_x.

Solution.

Cobb–Douglas preferences $U = Ax^{\alpha}y^{\beta}$ imply that the share of income spent on x is

$$\frac{\alpha}{\alpha + \beta}.$$

- *Group G:* $U_G = 4x^{0.5}y^{0.5}$. Here $\alpha = 0.5$, $\beta = 0.5$ so the spending share on x is

$$\frac{\alpha}{\alpha + \beta} = \frac{0.5}{1} = 0.5.$$

Individual demand:

$$x_G(P_x) = \frac{0.5\, m_G}{P_x} = \frac{0.5 \times 750}{P_x} = \frac{375}{P_x}.$$

- *Group B:* $U_B = x^{0.4}y^{0.4}$. Here $\alpha = 0.4$, $\beta = 0.4$ so the spending share on x is

$$\frac{\alpha}{\alpha + \beta} = \frac{0.4}{0.8} = 0.5.$$

Individual demand:

$$x_B(P_x) = \frac{0.5\, m_B}{P_x} = \frac{0.5 \times 500}{P_x} = \frac{250}{P_x}.$$

There are 100 consumers of each type:

$$Q_x(P_x) = 100\, x_G(P_x) + 100\, x_B(P_x) = 100\left(\frac{375}{P_x} + \frac{250}{P_x}\right) = 100 \cdot \frac{625}{P_x} = \frac{62{,}500}{P_x}.$$

Market demand for x:

$$\boxed{Q_x(P_x) = \frac{62{,}500}{P_x}}.$$

Question 4 — Short Answer Questions (20 marks)

4.1 [20 marks]

A firm has **fixed cost** $FC = 16$. Its average variable cost at discrete output levels is given by:

$$AVC(Q) = Q, \qquad Q = 1, 2, 3, 4, 5, 6.$$

The firm operates in a perfectly competitive market.

The (incomplete) cost table is:

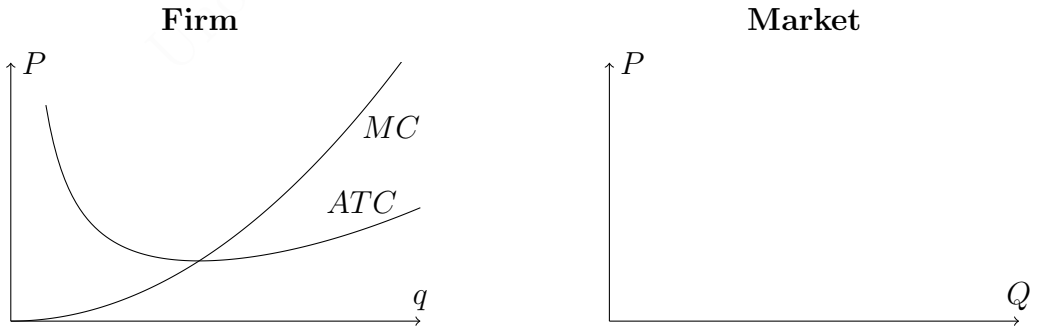
Q	AVC	MC	ATC
1	1		
2	2		
3	3		
4	4		
5	5		
6	6		

(a) Complete the table for MC and ATC. [8 marks]

(b) If the market price is $P = 10$, how many units will the firm supply in the **short run**? (Assume it can only choose integer output levels.) [4 marks]

(c) In the **long run**, what happens to market price P, total market quantity demanded Q_D, and each firm's quantity supplied q_i? State whether each rises, falls, or remains the same, under the assumption of a *constant-cost industry*. [4 marks]

(d) Draw the **long-run industry supply curve** for this constant-cost industry? [4 marks]



Solution.

(a) Since $AVC(Q) = Q$, we have

$$VC(Q) = AVC(Q) \cdot Q = Q \cdot Q = Q^2,$$

$$TC(Q) = FC + VC(Q) = 16 + Q^2.$$

Treating Q as continuous, marginal cost is

$$MC(Q) = \frac{dTC}{dQ} = 2Q.$$

Average total cost:

$$ATC(Q) = \frac{TC(Q)}{Q} = \frac{16 + Q^2}{Q} = \frac{16}{Q} + Q.$$

Now compute for $Q = 1, \ldots, 6$:

Q	AVC	$MC = 2Q$	$ATC = \frac{16}{Q} + Q$
1	1	2	$16 + 1 = \mathbf{17}$
2	2	4	$8 + 2 = \mathbf{10}$
3	3	6	$\frac{16}{3} + 3 \approx \mathbf{8.33}$
4	4	8	$4 + 4 = \mathbf{8}$
5	5	10	$\frac{16}{5} + 5 = 3.2 + 5 = \mathbf{8.2}$
6	6	12	$\frac{16}{6} + 6 \approx 2.67 + 6 = \mathbf{8.67}$

Minimum ATC occurs at $Q = 4$ with $ATC_{\min} = 8$.

(b) In perfect competition, short-run profit maximization requires $P = MC$ for interior solutions, provided $P \geq AVC$. With $P = 10$:

$$10 = 2Q \quad \Rightarrow \quad Q = 5.$$

At $Q = 5$, $AVC = 5 < 10$, so the firm covers its variable costs and does not shut down.

Short-run quantity supplied: $Q^{SR} = 5$.

(c) At $P = 10$ and $Q = 5$, the firm's ATC is approximately 8.2, so the firm is making *positive* economic profit. In a **constant-cost** competitive industry, positive profit induces entry:

- More firms enter; market supply shifts right.
- The market price **falls** until it reaches $P = \min ATC = 8$.
- At $P = 8$, each firm produces at the efficient scale $Q = 4$, so each firm's quantity supplied **falls** from 5 to 4.

- Lower price causes total market quantity demanded Q_D to **rise**.

Summary (relative to the short-run situation at $P = 10$):

$$P : \text{falls}, \quad Q_D : \text{rises}, \quad q_i : \text{falls (to 4)}.$$

(d) In a constant-cost industry, entry and exit leave input prices and firms' cost curves unchanged. Long-run equilibrium occurs where firms earn zero economic profit, i.e. at the minimum point of ATC. All firms are identical, so:

- The long-run industry supply curve (LRS) is **horizontal** at $P = \min ATC = 8$.

On the market diagram, draw a horizontal line at $P = 8$ to represent the LRS.