FREE SAMPLE: THE FIRST QUESTION

Question One (8 marks)

(a) Use information from Resource A and your knowledge of micro-economic theory.

Explain, with a labelled diagram, why the water network is a natural monopoly and why, if unregulated, it will produce less than the allocatively efficient output.

[2 marks]

(b) Calculate the unregulated output, price, profit and deadweight loss (all in $ thousand where they are money).

[2 marks]

(c) Calculate the output, price and the profit or loss under (i) marginal-cost pricing and (ii) average-total-cost pricing, and the deadweight loss under each. Give outputs and prices to 2 decimal places and the deadweight loss to the nearest $0.1 thousand.

[2 marks]

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(d) Evaluate the three options available to the council (leave it unregulated, marginal-cost pricing funded from rates, average-cost pricing). Recommend one, and say whether any other pricing scheme could do better.

[2 marks]

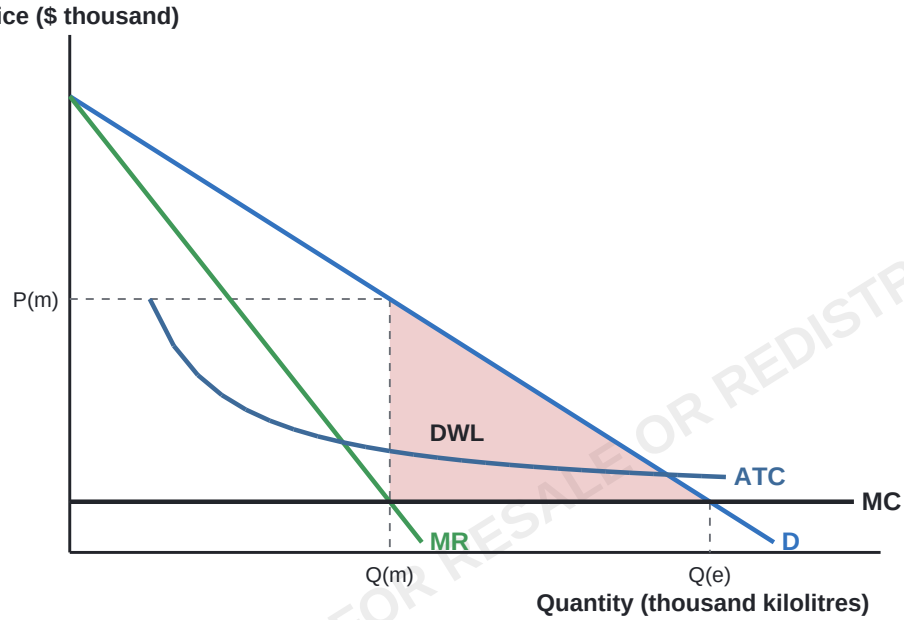
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THE WORKED ANSWER TO THAT QUESTION

Question 1 (8 marks) [Natural monopoly and regulation]

(a) Use information from Resource A and your knowledge of micro-economic theory. Explain, with a labelled diagram, why the water network is a natural monopoly and why, if unregulated, it will produce less than the allocatively efficient output.



Red triangle: deadweight loss from the monopoly output Q(m) instead of the efficient output Q(e), where P = MC.

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(a) Answer: Falling average cost over the whole market; MR below price so the monopolist restricts output

- Entry step: worth marks in the 1-4 range of the 8-point question score.
- Fixed costs are large and marginal cost is constant, so average total cost = 400 ÷ Q + 10 falls as output rises and keeps falling over the whole range of demand. One firm can supply the market at lower cost than two, so competition is wasteful and a single seller emerges (a natural monopoly). [1 mark]
- A monopolist faces the downward-sloping market demand curve, so to sell more it must lower the price on every unit: marginal revenue lies below demand. It maximises profit where MR = MC, at Q = 40, and charges 50 from the demand curve. The allocatively efficient output is where price = MC (Q = 80); between the two outputs each unit is worth more to consumers than it costs to supply, so there is a deadweight loss. [1 mark]

KEY TAKEAWAY

A natural monopoly has falling average cost over the market; any monopolist sets MR = MC and prices off the demand curve, so output is too low.

(b) Calculate the unregulated output, price, profit and deadweight loss (all in $ thousand where they are money).

(b) Answer: Q = 40 thousand kL at P = 50; profit $1200 thousand; DWL $800 thousand

- Scholarship band (5-6): the part needs your own method and accurate reasoning.
- MR = 90 − 2Q; setting MR = MC = 10 gives Q = 40 and P = 90 − 40 = 50. ATC at that output = 400 ÷ 40 + 10 = 20, so profit = (50 − 20) × 40 = $1200 thousand. [1 mark]
- The efficient output has P = MC: 90 − Q = 10, so Q = 80. Deadweight loss = ½ × (P − MC) × (Q(e) − Q(m)) = ½ × (50 − 10) × (80 − 40) = $800 thousand. [1 mark]

> **KEY TAKEAWAY**
> A monopolist's profit-maximising output sets MR = MC; the DWL triangle has height P − MC at that output and base the shortfall from the P = MC output.

(c) Calculate the output, price and the profit or loss under (i) marginal-cost pricing and (ii) average-total-cost pricing, and the deadweight loss under each. Give outputs and prices to 2 decimal places and the deadweight loss to the nearest $0.1 thousand.

(c) Answer: (i) Q = 80 at P = 10, loss $400 thousand, DWL 0; (ii) Q = 74.64 at P = 15.36, normal profit, DWL $14.4 thousand

- Scholarship band (5-6): the part needs your own method and accurate reasoning.
- (i) P = MC = 10 gives Q = 80. ATC = 400 ÷ 80 + 10 = 15 > P, so the loss is (15 − 10) × 80 = $400 thousand (exactly the fixed cost). Allocative efficiency is achieved: DWL = 0. [1 mark]
- (ii) P = ATC: 90 − Q = 400 ÷ Q + 10, so $Q^2 - 80Q + 400 = 0$, giving Q = [80 + √(6400 − 1600)] ÷ 2 = 74.64 (the larger root, which gives the greater output with price still equal to ATC). P = 90 − 74.64 = 15.36, so profit is zero. DWL = ½ × (15.36 − 10) × (80 − 74.64) = $14.4 thousand. [1 mark]

> **KEY TAKEAWAY**
> Marginal-cost pricing is allocatively efficient but loses the fixed cost; average-cost pricing breaks even with a small deadweight loss; compare options by the output reached and who funds the shortfall.

(d) Evaluate the three options available to the council (leave it unregulated, marginal-cost pricing funded from rates, average-cost pricing). Recommend one, and say whether any other pricing scheme could do better.

(d) Answer: Average-cost pricing, or marginal-cost pricing with a fixed charge covering the $400 thousand (two-part tariff)

- Outstanding band (7-8): the part needs insight and a complete, well-supported argument.
- Efficiency and cost: leaving the network unregulated gives the worst outcome (output 40 against 80 and a deadweight loss of $800 thousand) and charges consumers $1600 thousand a year more than P = MC would. The council owns the network, so the $1200 thousand of profit returns to the public purse rather than to private shareholders, but it is a hidden tax on water users, and the deadweight loss is lost to everyone. Marginal-cost pricing is allocatively efficient, but the $400 thousand shortfall must come from rates, which are themselves a tax with their own distortions and fall on ratepayers who may use little water. The network is also guaranteed its loss will be covered, with little incentive to cut costs. [1 mark]
- Judgement: average-cost pricing sets a price of $15.36 thousand per thousand kL, needs no subsidy and loses only $14.4 thousand of efficiency, so it is the best simple choice, though it depends on the regulator knowing true costs (the network can inflate costs and still break even). A two-part tariff, a fixed charge covering the $400 thousand plus a usage price of 10, reaches Q = 80 with no subsidy. Consumer surplus at P = MC is $3200 thousand, far more than the fixed charge, so households in

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total are better off; the drawback is equity, since a flat fee takes a bigger share of low incomes and may deter some households from connecting, so the fee could be income-related or capped. [1 mark]

KEY TAKEAWAY

Regulating a natural monopoly is a trade-off between allocative efficiency, the funding of fixed costs and the incentive to control costs; a two-part tariff gets P = MC and covers the fixed cost.

LOS: Natural monopoly and regulation (93402)