SMM641 REVENUE MANAGEMENT AND PRICING

Individual Problem Set 2

Question 1:

(a)

The optimal single price is: £ 8

The maximum revenue is: £ 1,349,008.69

The emission level: 49,323,716.96 g/km

(b)

The optimal peak price is: £ 9

The maximum revenue with peak pricing is: £ 1,371,826.09

The total emissions with peak pricing are: 46,241,455.67 g/km

In part (a), with a single congestion charge, the maximum revenue is £1,349,008.69, and emissions total 49,323,716.96 g/km. In part (b), implementing peak pricing with a non-peak price of £7 results in a slightly higher revenue of £1,371,826.09, an increase of £22,817.40 (+1.69%). More importantly, emissions decreased to 46,241,455.67 g/km, a reduction of 3,082,261.29 g/km (-6.25%). Thus, peak pricing not only boosts revenue but also significantly lowers emissions, offering both economic and environmental benefits.

(c)

The recommended peak price to minimize emissions is: £ 17

The revenue at the recommended price is: £ 1,405,000

The emissions at the recommended price is: 24,934,992.82 g/km

The recommended peak price is £17, as it minimizes emissions while ensuring the programme remains self-sustaining with revenue exceeding the required £1.1 million. At £17, revenue is £1,405,000, slightly higher than the £1,371,826.09 generated at £9 in part (b), and emissions are significantly reduced to 24,934,992.82 g/km, nearly 46% lower than the 46,241,455.67 g/km at £9. This higher peak price balances the City's objectives of minimizing emissions, maintaining financial sustainability, and supporting public transport reinvestment, making it a better option compared to the revenue-maximizing price of £9.

Question 2:

In this question I will be analyzing the same practical setting as problem set 1, which is a barbershop in my hometown. Using data from the appointment booking app, I would collect choice data from clients. This choice data is representative of price preference/willingness to pay at various time slots for the preferred services of individual clients. This data would help to guide the implementation of peak and non-peak pricing. Price optimization during the peak and non-peak periods will increase revenue, help to redistribute demand across time periods, and improve profitability by balancing workloads.

Using this choice data, we would first need to calculate the Maximum Likelihood Estimation (MLE). This would give us the probabilities for which any customer will select any of the time slots, price, or service type. A utility function could then be used to estimate how customers value a haircut under different conditions (price, time slot, service). Once estimated, we could use those parameters to forecast demand at varying price points, find the optimal peak pricing to maximize revenue and maintain demand, and set non-peak discounts to attract price-sensitive customers and fill unused capacity.