**OM 386: Pricing & Revenue Management**

**Assignment #5**

*Please paste your answers within this file and save it as “HW5\_ eid1\_eid2\_eid3” (Where eids refer to your group members’ EIDs) on Canvas at appropriate place. If you used MS Excel or any other statistical software to arrive at your answers, please submit the relevant files/annotated code as well.*

**Write the names of your team members here**:

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Problem 1. The Hilton Austin has a capacity of 350 standard rooms. Demand varies across days. Suppose Hilton is considering the prices for the following days, for which the demands follow the following linear functions.

|  |  |  |
| --- | --- | --- |
| Day of consideration | D\_i | m\_i |
| Apr 1 | 1100 | 10 |
| Apr 2 | 700 | 8 |
| Apr 3 | 650 | 7 |
| Apr 4 | 700 | 8 |
| Apr 5 | 1000 | 11 |
| Apr 6 | 1300 | 12 |
| Apr 7 | 1600 | 16.5 |

1. Suppose Hilton can only charge a single price across the days. Solve the optimal price. (10 points)

Table

Description automatically generated

**Ans:**

**Optimal price = $60.29**

1. Suppose Hilton can use variable pricing. Solve the optimal prices across the days. (10 points)

Table

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**Ans:**

**Optimal Prices:**

|  |  |
| --- | --- |
| Date | Price ($) |
| Apr 1 | $75.00 |
| Apr 2 | $43.75 |
| Apr 3 | $46.10 |
| Apr 4 | $43.76 |
| Apr 5 | $59.09 |
| Apr 6 | $79.17 |
| Apr 7 | $75.76 |

Problem 2. Based on the demand table in the above, assume that every arriving customer during this period always stays for 2 nights and pays the list price of the arrival day for each night. For example, a customer arrives on Apr 1 and the list price on Apr 1 is $50; then this customer pays 2\*$50 for the two nights of her/his stay. Also assume there is no demand on the days before Apr 1 and the days after Apr 7 (i.e., no need to worry about the past or the future of this period).

Suppose Hilton publishes all the prices online, so every customer can see the prices of the 7 days before they arrive. After seeing the prices, the customers may change their arrival time to the next day of their original arrival (only one day ahead) if the next day has a lower price unless all the rooms of the next day are expected to be full. Every $1 difference of the two prices can cause 1 customer to shift (these are assumed to be the base units; you don’t need to round in case the price difference has decimals). For instance, if the price on Apr 1 is $50 while the price on Apr 2 is $48.5, then 1.5 customers who originally would arrive on Apr 1 would like to shift their arrival to Apr 2 subject to the capacity constraint on Apr 2 and Apr 3. Also, assume that there is no customer before Apr 1 and the customers on Apr 7 won’t shift to the future.

Solve the optimal prices across the days. (20 points)

Table

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**Ans:**

**Optimal Prices:**

|  |  |
| --- | --- |
| Date | Price ($) |
| Apr 1 | $83.80 |
| Apr 2 | $74.75 |
| Apr 3 | $60.76 |
| Apr 4 | $73.14 |
| Apr 5 | $69.54 |
| Apr 6 | $97.85 |
| Apr 7 | $83.38 |

Problem 3. Jena gets the idea to start a business selling a new line of clothing—puffy shirts. Due to the long lead time, Jena needs to get the shifts from a supplier well before the selling season and there is no replenishment opportunity afterwards. Jena estimated that the selling season will last 3 months, in which the linear demand functions will be as follows:

|  |  |  |
| --- | --- | --- |
| Month | D\_i | m\_i |
| 1 | 280 | 3.5 |
| 2 | 230 | 3.5 |
| 3 | 150 | 4 |

Jena thinks that she can salvage the shirts at $12 per unit if there is any leftover by the end of month 3.

1. Suppose Jena is given 300 shirts for free. Find the optimal markdown price scheme for her in these three months (p1>p2>p3). (20 points)

Chart, waterfall chart

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**Ans:**

**P1 = $ 46.00**

**P2 = $38.86**

**P3 = $24.75**

1. After conducting this business for one time, Jena realized that the selling season actually can last 5 months, and this time she estimated the demand functions as follows:

|  |  |  |
| --- | --- | --- |
| Month | D\_i | m\_i |
| 1 | 280 | 3.5 |
| 2 | 230 | 3.5 |
| 3 | 150 | 4 |
| 4 | 120 | 4 |
| 5 | 120 | 6 |

Again, suppose she is given for free 300 shirts, and she thinks that any leftover shirt can be salvaged $12 per unit by the end of month 5. Find the optimal markdown price scheme in the five months (p1>p2>p3>p4>p5). (10 points)

Table

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**Ans:**

**P1 = $47.14**

**P2 = $40.00**

**P3 = $25.89**

**P4 = $22.14**

**P5 = $17.14**

1. Compare the optimal pricing schemes in the above two scenarios (e.g., whether any shirts are salvaged) and discuss possible reasons if there is difference. (10 points)

**Ans:**

We observe that there are no leftover shirts to be salvaged in scenario b) compared to 36 shirts that are salvaged in scenario a). This is due to the longer selling season and greater overall demand for the shirts in scenario b). It enables Jena to be able to price her shirts above the salvage price of $12 and still be able to sell them within the 5 month selling season.

1. Now consider scenario (b) again. Instead of being given the shirts, Jena needs to decide how many shirts to produce before Month 1, anticipating the demands and the prices she will charge in the following 5 months. She only has the chance to produce the shirts before Month 1 (i.e., she cannot replenish inventory afterwards). Suppose the production cost is $20 per shirt. All other information remains the same as in (b). What is the best amount of shirts to produce before Month 1 and what are the corresponding optimal prices to charge in the 5 months? (10 points)

Table

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**Ans:**

**P1 = $50.00**

**P2 = $42.86**

**P3 = $28.76**

**P4 = $25.00**

**P5 = $20.00**

**Shirts to produce before Month 1 = 240**

For all of the problems in the above, please turn in either spreadsheets or code you use to solve them.