Operations Research

Homework 11

Due on November 29, 2023

Note: Your homework must be submitted via moodle (see the link on the class website) on the due day BEFORE THE TUTORIAL, i.e., before 20:45.

Problem 1 [12 points]

Consider the decision analysis problem with the following payoff table (in units of thousands of dollars):

	State of Nature		
Alternative	S_1	S_2	S_3
A_1	-100	10	100
A_2	-10	20	50
A_3	10	10	60
Prior Probability	0.2	0.3	0.5

(a) Which alternative should be chosen? What is the resulting expected payoff?

(b) You are offered the opportunity to obtain information which will tell you with certainty whether the first state of nature S_1 will occur. What is the maximum amount you should pay for the information? Assuming you will obtain the information, how should it be used to choose an alternative? What is the resulting expected payoff (excluding the payment)?

(c) You are offered the opportunity to obtain information which asserts the true state of nature with an accuracy of 60% and wrongly identifies one of the other possible states of nature in 20% of cases each. What is the maximum amount you should pay for the information? Assuming you will obtain the information, how should it be used to choose an alternative? What is the resulting expected payoff (excluding the payment)?

Problem 2 [4 points]

(HL, Exercise 19.3-4.) The Blue Cab Company is the primary taxi company in the city of Maintown. It uses gasoline at the rate of 8 500 gallons per month. Because this is such a major cost, the company has made a special arrangement with the Amicable Petroleum Company to purchase a huge quantity of gasoline at a reduced price of $1.05 per gallon every few months. The cost of arranging for each order, including placing the gasoline

into storage, is \$1 000. The cost of holding the gasoline in storage is estimated to be \$0.01 per gallon per month.

Use the EOQ model to find the optimal order quantity.

Problem 3 [4 points]

(HL, Exercise 19.3-2.) The demand for a product is 600 units per week, and the items are withdrawn at a constant rate. The setup cost for placing an order to replenish inventory is \$25. The unit cost of each item is \$3, and the inventory holding cost is \$0.05 per item per week.

(a) Assuming shortages are not allowed, determine how often to order and what size the order should be.

(b) If shortages are allowed but cost \$2 per item per week, determine how often to order and what size the order should be.