

# Operations Research

## Homework 9

Due on November 15, 2021

**Note:** Your homework must be submitted via moodle (see the link on the class website) on the due day BEFORE THE TUTORIAL.

### Problem 1 [6 points]

A chip manufacturer produces CPUs that are so complex that it is impossible to test every single function of the CPU in a production run, but it is possible to design a test that finds a defect with probability  $p < 1$ . Moreover,  $\frac{9}{10}$  of all CPUs that are produced are defective. What value of  $p$  is needed to guarantee that 99% of all CPUs shipped work?

### Problem 2 [14 points]

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

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

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