

# Safety and Reliability of Embedded Systems (WS 15/16)

## Problem Set 1

Due Thursday, November 26<sup>th</sup>, 2015

### **Problem 1: Software Intensive Systems**

- a) Please define the general term “system” according to Birolini and explicitly name the parts a system can encompass. Explain your answer in the view of a technical field.
- b) What is the difference to a “technical system”?
- c) For the analysis of a technical (embedded) system it is crucial to extract it from its environment. How can this be achieved? Please sketch your ideas.
- d) Please list important non-functional requirements for embedded systems.

### **Problem 2: Reliability vs. Availability**

Please explain the difference between “reliability” and “availability”.

### **Problem 3: Safety vs. Security**

Please explain the terms “safety” and “security”.

What is meant by “technical safety” in comparison to “safety”?

### **Problem 4: Failure, Fault, Error**

What is meant by the terms “failure”, “fault”, and “error”? Please illustrate your answer by means of the “Ariane 5” disaster (see lecture).

### Problem 5: Hardware Failures vs. Software Failures

Please explain the differences between hardware failures and software failures.

### Problem 6: Correctness and Robustness

Please give your opinion on the following statements:

	true	false
Correctness has a binary character	<input type="checkbox"/>	<input type="checkbox"/>
An artifact is not consistent to its specification, if it is not correct	<input type="checkbox"/>	<input type="checkbox"/>
Robustness has a binary character	<input type="checkbox"/>	<input type="checkbox"/>
A correct system can have low robustness	<input type="checkbox"/>	<input type="checkbox"/>
Robustness is a property only of the implementation	<input type="checkbox"/>	<input type="checkbox"/>

### Problem 7: Correlation among Quality Characteristics

- a) Quality characteristics might influence each other. Think about the following dependencies and figure out, whether the influences are positive or negative.
- Safety – Availability
  - Safety – Reliability
  - Availability – Reliability
  - Efficiency\* – Safety/Reliability

\* Within ISO 9126, efficiency is defined in terms of time and resources behavior: level of performance of a system vs. the amount of resources used.