

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

Problem Set 1

Due Thursday, November 26th, 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.
- i. Safety – Availability
 - ii. Safety – Reliability
 - iii. Availability – Reliability
 - iv. 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.