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AG Software Engineering: Dependability

Safety and Reliability of Embedded Systems
(WS 11/12)

Problem Set 1

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 aviation.
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"?

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	☐	☐
Even if there are no defects, the program might not have to be correct	☐	☐
An artifact is not consistent to its specification, if it is not correct	☐	☐
Robustness has a binary character	☐	☐
A correct system can have low robustness	☐	☐
Robustness is a property only of the implementation	☐	☐

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.