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Software Quality Assurance (WS20/21)

Problem Set 1

Problem 1: Embedded 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”? Please give examples for the safety of a failure-free system and the technical safety of a failure afflicted system.

Problem 4: Failure, Fault

What is meant by the terms “failure” and “fault”? 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	☐	☐
If there are no defects, the program is correct	☐	☐
It can always be decided, whether an artifact is correct or not	☐	☐
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	☐	☐

Problem 7a: Quality Model

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. Reliability – Safety
   iii. Reliability – Availability
   iv. Efficiency – Safety/Reliability

Problem 7b: Quality Model

a) Within ISO 9126, the following quality characteristics and sub-characteristics are defined. Please, give a short definition for each one.
Note: You can find ISO 9126 here.

Quality characteristic	Sub-characteristics
Functionality	Suitability
	Accuracy
	Interoperability
	Compliance
	Security
Reliability	Maturity
	Recoverability
	Fault Tolerance
Usability	Learnability
	Understandability
	Operability
Efficiency	Time Behavior
	Resource Behavior
Maintainability	Stability
	Analyzability
	Changeability
	Testability
Portability	Installability
	Replaceability
	Adaptability