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Testing and Dependability: Exercise Sheet 2

Notes: Enter your name, student ID number, and degree program in the table below, and write your student ID number on each additional sheet you submit. If you use equations from the lecture, please include the equation numbers in your work. Write your solutions on the answer sheets as much as possible.

Name	Student ID Number	Degree Program	Points from12

Exercise 2.1: A system has a failure rate $\zeta_{\mathrm{CR}} = 10^{-6}\ \left[\frac{\mathrm{RA}}{\mathrm{CR}}\right]$ and a malfunction rate $\zeta = 2 \cdot 10^{-5}\ \left[\frac{\mathrm{MF}}{\mathrm{DS}}\right]$. Phantom malfunctions are negligible.

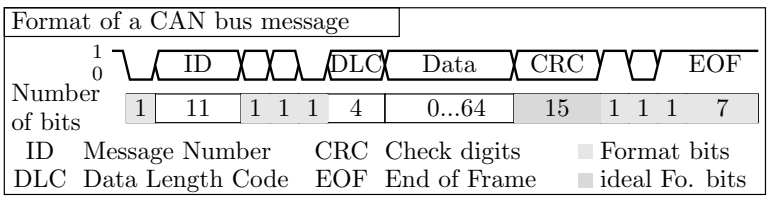
a) How reliable is the system without malfunction handling $R_{[/]}$, and within what range might the rates of observable malfunctions ζ_{OMF} fall? 2P

b) What is the minimum level of fault coverage required from the monitoring system in order to increase the system's reliability to at least $R = 10^6\ \left[\frac{\mathrm{DS}}{\mathrm{DMF}}\right]$ through fault handling? 2P

c) What is the delivery rate if the system responds to all detected issues by refusing delivery? 2P

Exercise 2.2: What is the minimum number of redundant bits required for a file of one Mbit to ensure that, under ideal format checking conditions, no more than 10^{-8} of any data errors remaining undetected? 2P

Exercise 2.3:



In a CAN bus message, at least the 15 CRC bits enable ideal format checking. Incoming messages containing format errors are discarded.

What is the maximum permissible malfunction rate for the transmission of CAN messages if the reliability is to be at least $R = 10^7$? The rate of observed malfunctions is negligible. 2P

Exercise 2.4: Questions on diversity. Please answer briefly. Marks will be awarded for the key terms:

a) Why is monitoring by duplication and comparison well suited to detecting malfunctions caused by disruptions, but poorly suited to detecting malfunctions caused by programming faults? 1P

b) Why is extended diversity through diverse usage unsuitable for master-checker systems? 1P

New symbols compared with the script version used in the lecture:

	ζ	$R_{[/]}$	without monitoring
$\eta_{\mathrm{DS}[0]}$	$\zeta_{[0]}$	$R_{[0]}$	without a repeat request
$\eta_{\mathrm{DS}[\mathrm{R}]}$	$\zeta_{[\mathrm{R}]}$	$R_{[\mathrm{R}]}$	Wiederholanforderung bis Erbringung
$\eta_{\mathrm{DS}[1]}$	$\zeta_{[1]}$	$R_{[1]}$	at most one repetition
η_{DS}	$\zeta_{[*]}$	R	with or without repetition