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Testing and Dependability: Exercise Sheet 4

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 4.1: Given a yield of $Y = 60\%$ and a defect coverage of $DC = 95\%$

a) What is the defect level after production?[1]? 1P

b) the defect level of the components tested after the identified defective components have been removed? 1P

Exercise 4.2: An printed circuit board consists of the following components, with their estimated failure rates shown in the table:

Type	Number	DL_{BT}	$\sum$ before rectif.	$\sum$ after rectif.
unassembled circuit board	1	30 dpm	dpm	dpm
integrated circuit	20	150 dpm	dpm	dpm
discrete components	50	10 dpm	dpm	dpm
Solder joints	500	1 dpm	dpm	dpm
assembled circuit board			dpm	dpm

The assembly test detects all placement and connection faults, as well as 10 per cent of defective components. All detected faults are rectified.

What is the expected defect rate of the assembled circuit board

a) before rectifying the detectable faults? 2P

b) after rectifying the detectable faults? 2P

[1]The defect level is the actual proportion of defective components, whilst the given yield is the proportion of defect-free components plus the proportion of components with undetectable defects.

Exercise 4.3: Assuming that the number of unresolved faults is reduced to one third when the test set length is increased tenfold.

a) Which exponent K of the malfunction rate distribution does this suggest? 2P

b) Given this value K, by what factor does a tenfold increase in the test set length reduce the fault-related malfunction rates from sub-task a? 2P

c) By what factor must the number of tests be increased in order to increase the fault-related partial reliability by a factor of one hundred? 2P