Chapter III: Probability - Exercises

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GROUP 89 - COMPUTER ENGINEERING

September 28th, 2010

Exercice

Let A and B be two events with positive probability, study their independence

a) in the case they are mutually exclusive;

b) in the case they are one the complementary of the other, i.e. $(B = \bar{A})$.

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SOLUTION:

a) They are NOT independent.

b) They are NOT independent.

Exercice

The quality department of a factory producing some mechanical items realized that a certain type of produced metal anchors may be defective due to the following causes:

defects in the thread and *defects in the size*.

It has been estimated that 6% of the anchors they produce has *defects in the thread*, while 9% have *defects in the size*. However, 90% of the anchors do not have any type of defect.

What is the probability that the item has both types of defects?

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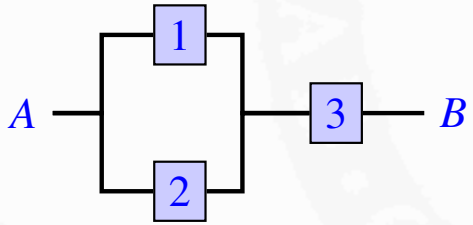
SOLUTION:

$$\Pr(\text{defective in the thread and in the size}) = 0.05$$

Exercise

We have a system of connected components according to the following figure:



All components are of similar reliability and have a probability of failure of 0.01. The failures of one component are independent of the state of other components. The system is functioning if you can find between A and B a path of components operating.
What is the probability that the system works?

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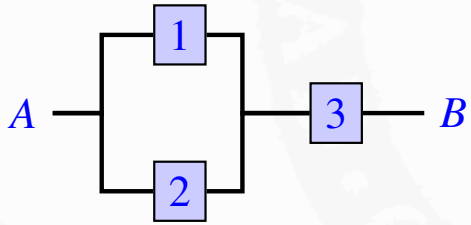

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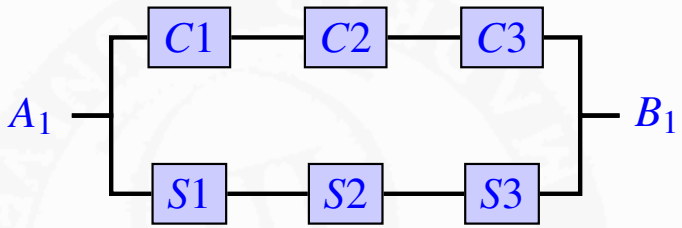
What is the probability that the system works?

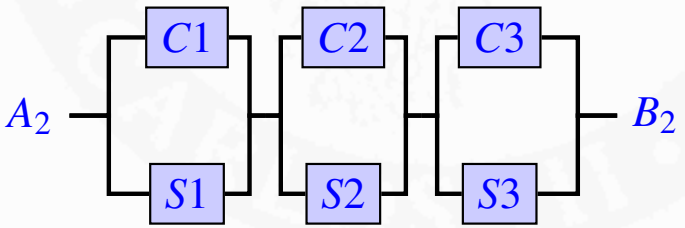
SOLUTION:

$$\Pr(\text{The system works}) = 98.99\%$$

Exercise

A machine consists of three components in series, each of which has a failure probability of 0.01. For security reasons it was decided to place three components in parallel with the first, to reduce the risk of damage to the machine. Assuming that all components act independently, which of the two alternatives presented in the figure is preferable, taking into account that, for economic reasons, the safety components are of inferior quality and have failure probability of 0.05?





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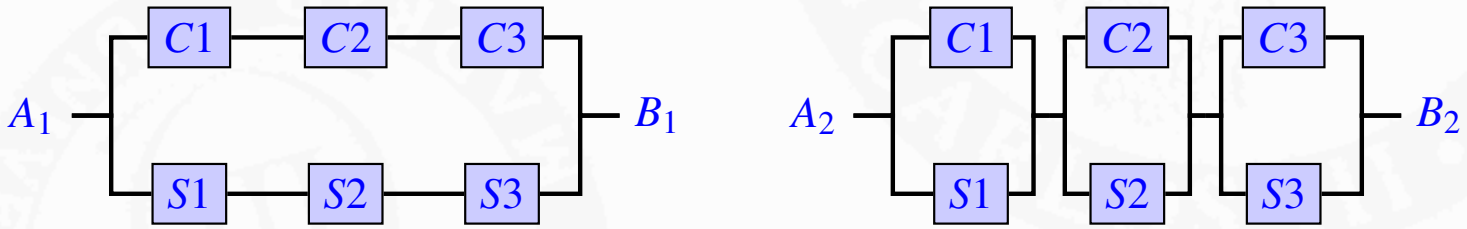

SOLUTION:

$$\Pr(\text{Failure of configuration } 1) = 4.236 \times 10^{-3}$$

$$\Pr(\text{Failure of configuration } 2) = 1.499 \times 10^{-3}.$$

It is therefore preferable to the alternative 2 the configuration 1.