

# SZS Blatt 2

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## Aufgabe 1

a)

b)

c)

d)

e)

f)

## Aufgabe 2

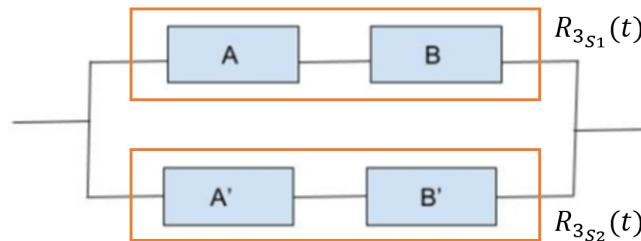
a)

**Abbildung 2:** RBD für die serielle Komposition



$$R_2(t) = R_A(t) * R_B(t) \quad (1)$$

**Abbildung 3:** RBD für die Systemredundanz



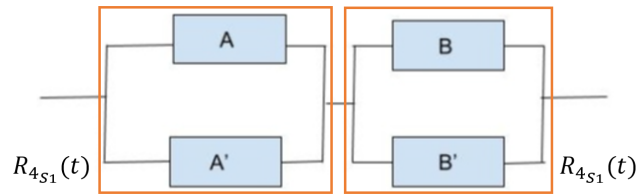
$$R_{3_{S1}}(t) = R_A(t) * R_B(t) \quad (2)$$

$$R_{3_{S2}}(t) = R_{A'}(t) * R_{B'}(t) \quad (3)$$

$$\begin{aligned} R_3(t) &= 1 - [(1 - R_{3_{S1}}(t)) * (1 - R_{3_{S2}}(t))] \\ &= 1 - [(1 - R_A(t) * R_B(t)) * (1 - R_{A'}(t) * R_{B'}(t))] \\ &\Leftrightarrow 1 - [(1 - R_A(t) * R_B(t)) * (1 - R_A(t) * R_B(t))] \\ &= 1 - [(1 - R_A(t) * R_B(t))^2] \\ &= 1 - [1 - 2 * R_A(t) * R_B(t) + R_A(t)^2 * R_B(t)^2] \\ &= R_A(t)^2 * R_B(t)^2 + 2 * R_A(t) * R_B(t) \end{aligned} \quad (4)$$

$$R_3(t) = R_A(t)^2 * R_B(t)^2 - 2 * R_A(t) * R_B(t) \quad (5)$$

**Abbildung 4:** RBD für die Komponentenredundanz



$$R_{4_{S1}}(t) = 1 - [(1 - R_A(t)) * (1 - R_{A'}(t))] \quad (6)$$

$$R_{4_{S2}}(t) = 1 - [(1 - R_B(t)) * (1 - R_{B'}(t))] \quad (7)$$

$$\begin{aligned} R_4(t) &= R_{4_{S1}}(t) * R_{4_{S2}}(t) \\ &= (1 - [(1 - R_A(t)) * (1 - R_{A'}(t))]) * (1 - [(1 - R_B(t)) * (1 - R_{B'}(t))]) \\ \Leftrightarrow & (1 - [(1 - R_A(t)) * (1 - R_{A'}(t))]) * (1 - [(1 - R_B(t)) * (1 - R_{B'}(t))]) \\ &= (1 - (1 - R_A(t))^2) * (1 - (1 - R_B(t))^2) \\ &= (1 - (1 - 2 * R_A(t) + R_A(t)^2)) * (1 - (1 - 2 * R_B(t) + R_B(t)^2)) \\ &= (2 * R_A(t) - R_A(t)^2) * (2 * R_B(t) - R_B(t)^2) \end{aligned} \quad (8)$$

$$R_4(t) = (2 * R_A(t) - R_A(t)^2) * (2 * R_B(t) - R_B(t)^2) \quad (9)$$

**b)**

Beispiel:

$$R_A(t) = R_B(t) = 0.5 \quad (10)$$

$$\begin{aligned} R_2(t) &= R_A(t) * R_B(t) \\ &= 0.5 * 0.5 \\ &= 0.25 \\ R_3(t) &= R_A(t)^2 * R_B(t)^2 - 2 * R_A(t) * R_B(t) \\ &= 0.5^2 * 0.5^2 - 2 * 0.5 * 0.5 \\ &= 0.4375 \\ R_4(t) &= (2 * R_A(t) - R_A(t)^2) * (2 * R_B(t) - R_B(t)^2) \\ &= (2 * 0.5 - 0.5^2) * (2 * 0.5 - 0.5^2) \\ &= 0.5625 \end{aligned} \quad (11)$$

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## Aufgabe 3

a)

b)

c)

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## Aufgabe 2

a)

b)

c)

d)