

$\Pr(\underbrace{A \text{ and } B}) = \Pr(A) * \Pr(B) \rightarrow$ Independence case

two separate events

General case

$$\begin{aligned}\Pr(A \text{ and } B) &= \Pr(A) * \Pr(B|A) \\ &= \Pr(B) * \Pr(A|B)\end{aligned}$$

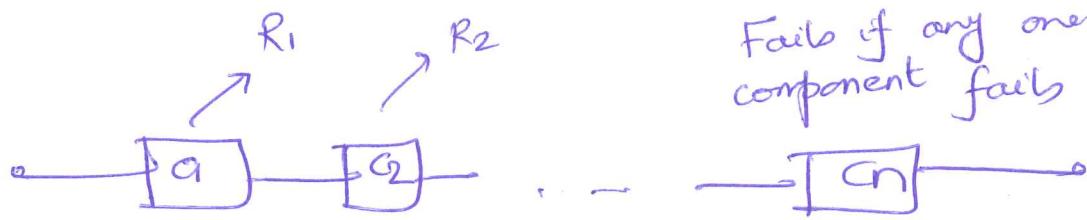
Independence of n events

$A, B, C \quad (n=3)$

$$C(3, 2) \left[\Pr(A \cap B) = \Pr(A) * \Pr(B) \right]$$

$$C(3, 3) \left[\Pr(A \cap B \cap C) = \Pr(A) * \Pr(B) * \Pr(C) \right]$$

Series System

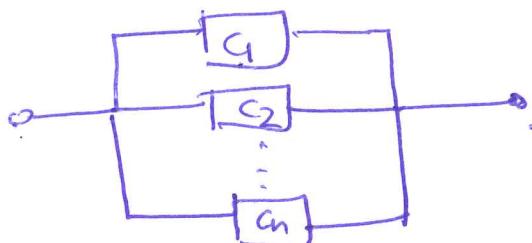


$R_{sys} = \Pr(C_1 \text{ works} \cap C_2 \text{ works} \cap \dots \cap C_n \text{ works})$
under independence,

$$R_1 * R_2 * \dots * R_n \\ = \prod_{i=1}^n R_i$$

$R_{sys} \leq R_i$ for any i

Parallel system



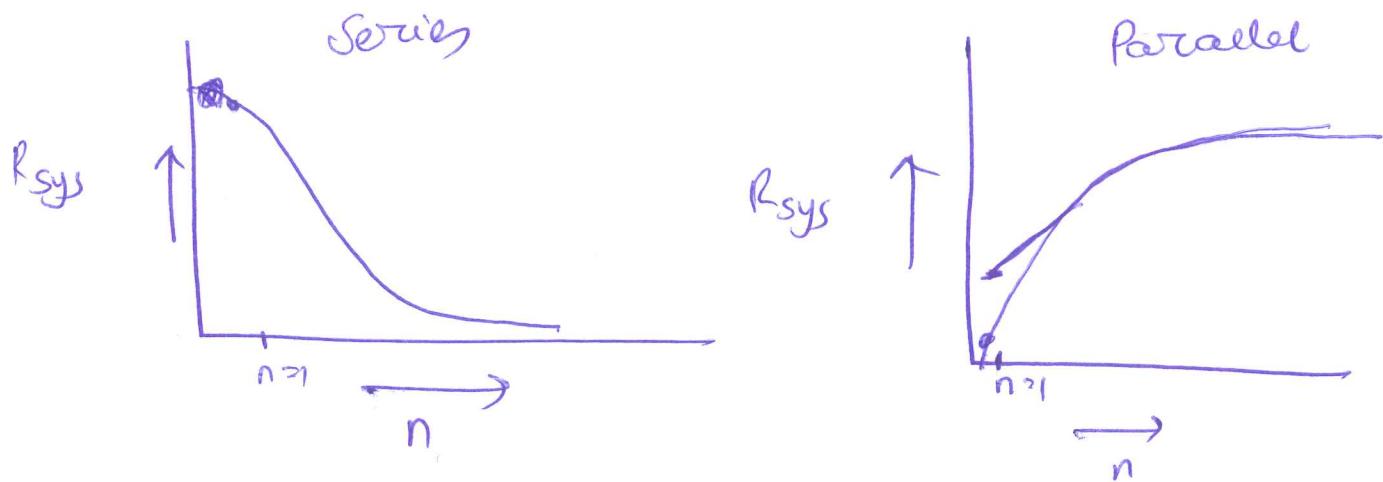
$\Pr(\text{sys fails}) = \Pr(C_1 \text{ fails} \cap C_2 \text{ fails} \cap \dots \cap C_n \text{ fails})$

$$R_{sys} = 1 - \Pr(\text{sys fails})$$

Under independence: $R_{sys} = 1 - [(1-R_1) \cdot (1-R_2) \dots (1-R_n)]$

$$R_{sys} \geq R_i, \forall i$$

$$= 1 - \prod_{i=1}^n (1-R_i)$$



H2

$$\begin{aligned} \Pr(\text{sys fails}) &= \Pr(\text{sys fails} | E_1) * \Pr(E_1) + \\ &\quad \Pr(\text{sys fails} | E_2) * \Pr(E_2) + \\ &\quad \Pr(\text{sys fails} | \overline{E_1 \cup E_2}) * \Pr(\overline{E_1 \cup E_2}) \end{aligned}$$

$$\begin{aligned} &= \cancel{0.3 * 0.} \quad 0.05 * 0.3 + \\ &\quad 0.01 * 0.4 + \\ &\quad 0 * 0.3 \\ &= 0.055 \end{aligned}$$

$$R_{\text{sys}} = 1 - 0.055 = 0.945$$