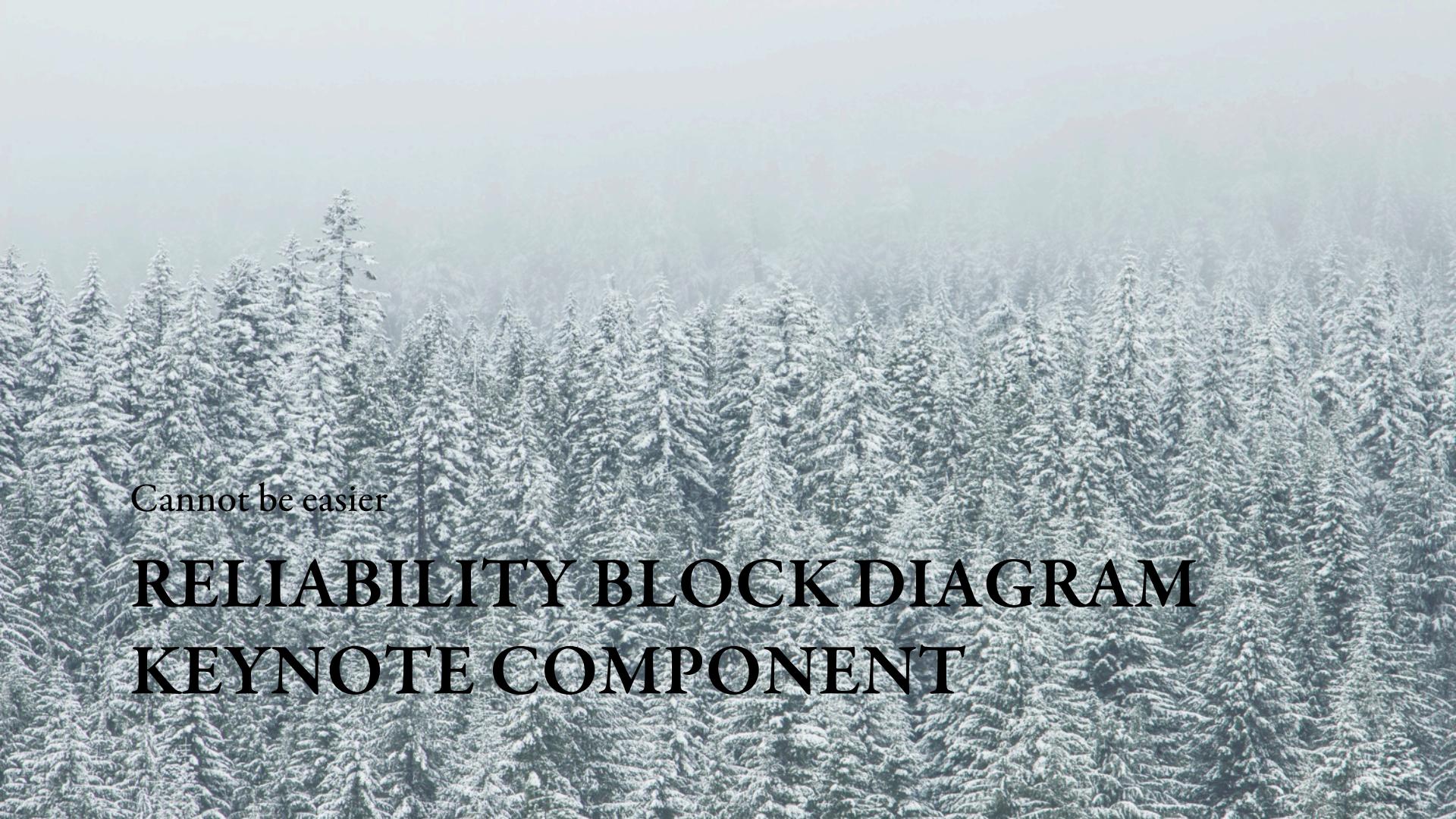




ASQ CRE Prep course

Lesson IV. A. 2. e.

Reliability Block Diagrams
and Models – Keynote

The background of the image is a dense forest of tall evergreen trees, heavily laden with snow. The trees are packed closely together, creating a textured, dark green surface. The sky above is a uniform, pale grey, suggesting a heavy fog or overcast day. The overall atmosphere is quiet and cold.

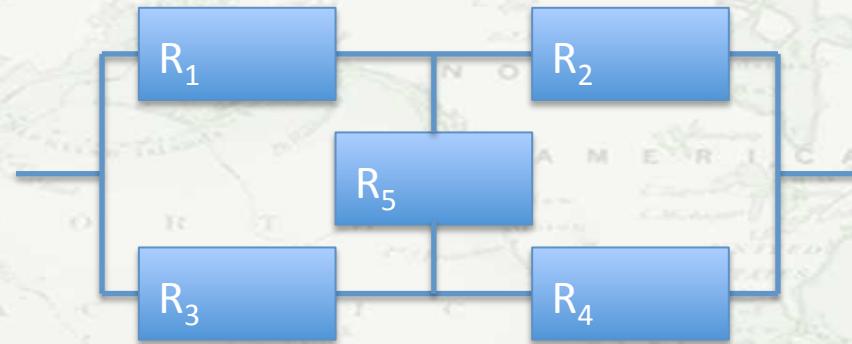
Cannot be easier

RELIABILITY BLOCK DIAGRAM KEYNOTE COMPONENT

Bayes' Theorem Approach

What if R_5 is good?

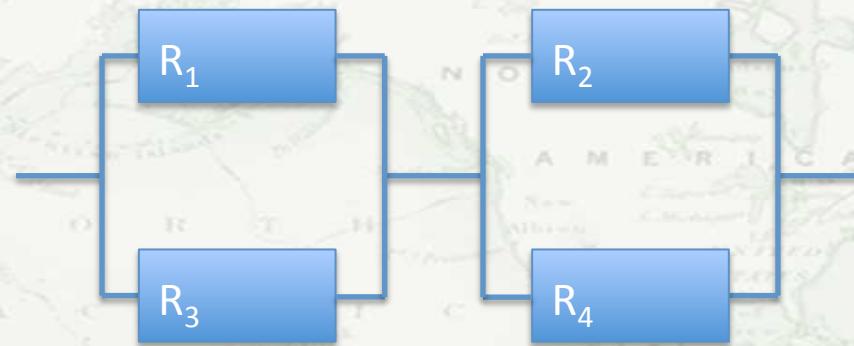
What if R_5 is Bad?



Bayes' Theorem Approach

What if R_5 is good?

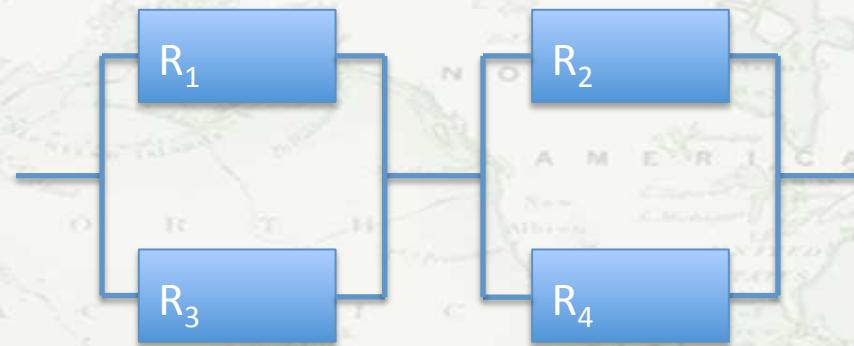
Probability of two parallel elements in series and R_5 good



Bayes' Theorem Approach

What if R_5 is bad?

**Probability of failure
with two series
elements in parallel
and R_5 bad**



Truth Table Approach

Work out all the possibilities

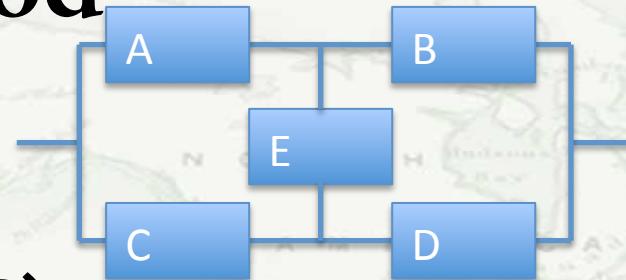
Calculate all successful options

**For this simple example there are 32 permutations
(2^5)**

**Each row that works is product of good and bad
probabilities**

Tie Set Method

$$\begin{aligned} R_{\text{sys}} &= P(AB \cup CD \cup AED \cup CEB) \\ &= P(AB) + P(CD) + P(AED) + P(CEB) \\ &= -P(ABCD) - P(ABED) - P(ABCE) - P(ACED) \\ &\quad - P(CDEB) - P(ABCDE) \\ &= +P(ABCDE) + P(ABCDE) + P(ABCDE) \\ &\quad + P(ABCDE) \\ &= -P(ABCDE) \end{aligned}$$



Cut Set Method

R_{sys}

$$= 1 - P(\overline{AC} \cup \overline{BD} \cup \overline{AED} \cup \overline{CEB})$$

$$= +P(AC) + P(BD) + P(AED) + P(CEB)$$

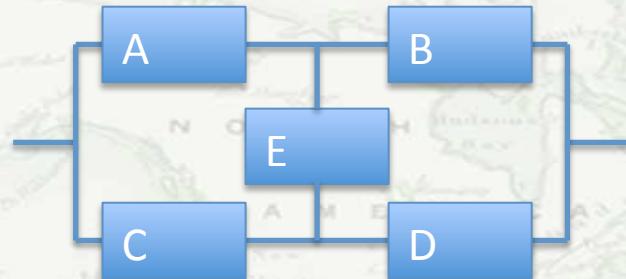
$$= -P(ACBD) - P(ACED) - P(ACEB) - P(BDAE)$$

$$- P(BDCE)$$

$$= -P(ABCDE) - P(ABCDE)$$

$$= +P(ABCDE) + P(ABCDE) + P(ABCDE) + P(ABCDE)$$

+1, -2, +3, -4 (use unreliability)



What is the limiting
assumption with
RBD?



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Lesson IV. A. 3.

Physics of Failure Models