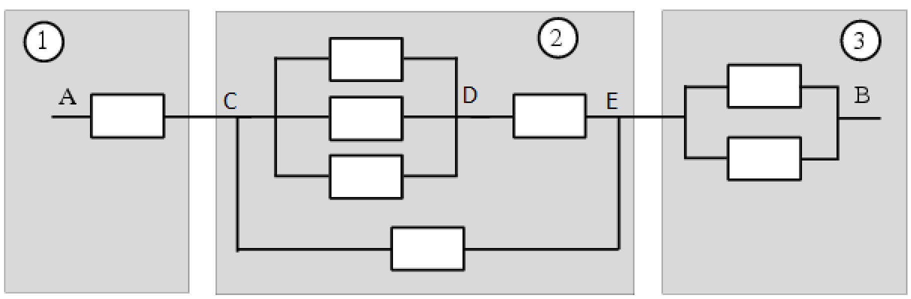
This problem is similar in nature to Example 1.24, page 40. In order to compute the success probability of individual sub-systems, we make use of the following two properties, derived in that example:

- If a *serial* sub-system contains m components with success probabilities $p_1, p_2 ... p_m$, then the probability of success of the entire sub-system is given by

$$\mathbf{P}(\text{whole system succeeds}) = p_1 p_2 p_3 ... p_m$$

- If a *parallel* sub-system contains m components with success probabilities $p_1, p_2 ... p_m$, then the probability of success of the entire sub-system is given by

$$\mathbf{P}(\text{whole system succeeds}) = 1 - (1 - p_1)(1 - p_2)(1 - p_3)...(1 - p_m)$$



Let $\mathbf{P}(X \to Y)$ denote the probability of a successful connection between node X and Y. Then,

$$\begin{aligned}
\mathbf{P}(A \to B) &= \mathbf{P}(A \to C)\mathbf{P}(C \to E)\mathbf{P}(E \to B) \text{ (since they are in series)} \\
\mathbf{P}(A \to C) &= p \\
\mathbf{P}(C \to E) &= 1 - (1 - p)\,(1 - \mathbf{P}(C \to D)\mathbf{P}(D \to E)) \\
\mathbf{P}(E \to B) &= 1 - (1 - p)^2
\end{aligned}$$

The probabilities $\mathbf{P}(C \to D)$, $\mathbf{P}(D \to E)$ can be similarly computed as

$$\begin{aligned}
\mathbf{P}(C \to D) &= 1 - (1 - p)^3 \\
\mathbf{P}(D \to E) &= p
\end{aligned}$$

The probability of success of the entire system can be obtained by substituting the subsystem success probabilities:

$$\mathbf{P}(A \to B) = p\left\{1 - (1-p)\Big[1 - p\big[1 - (1-p)^3\big]\Big]\right\}\big[1 - (1-p)^2\big]\,.$$