

Probability

Reliability Analysis | Conditional Probability

Prof. Dr. Mostafa Elhosseini

<https://youtube.com/drmelhosseini>

| Reliability analysis

- **Reliability analysis** is the branch of engineering concerned with **estimating the failure rates of systems.**

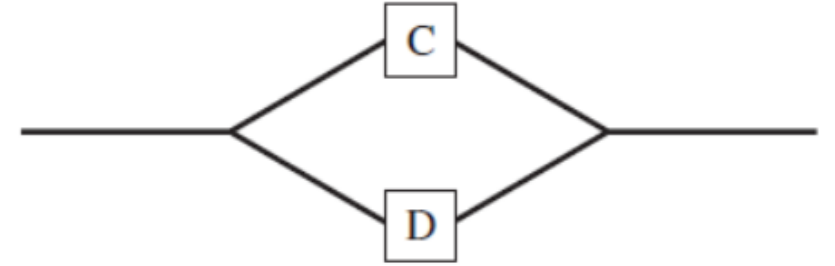
| Example - 01



- A system contains **two components, A and B, connected in series** as shown in the following diagram. The system will **function only if both** components function. The probability that **A functions** is given by $P(A) = 0.98$, and the probability that **B functions** is given by $P(B) = 0.95$. Assume that **A and B function independently**.

Find the probability that the system functions.

| Example - 02



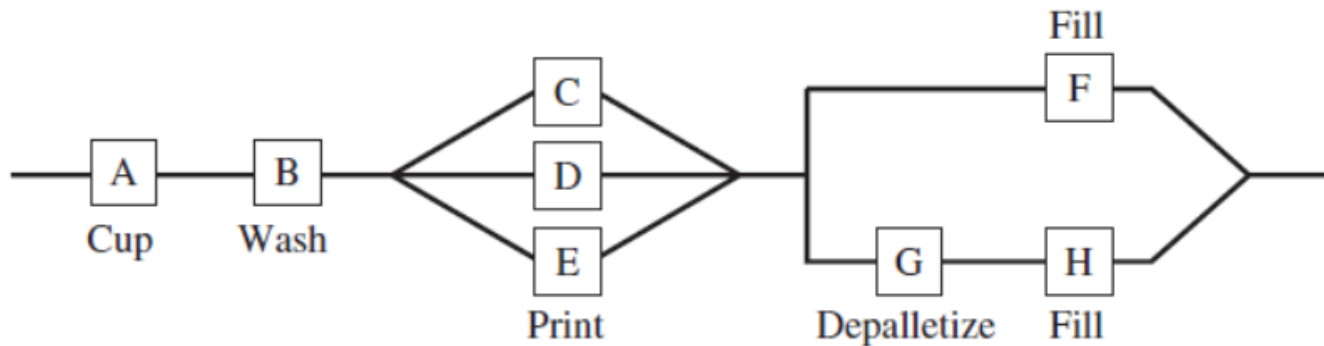
- A system contains **two components, C and D**, connected in **parallel** as shown in the following diagram.
- The system will **function if either C or D functions**. The probability that **C functions is 0.90**, and the probability that **D functions is 0.85**. Assume C and D function independently.

Find the probability that the system functions.

| Note

- The reliability of more complex systems can often be determined by **decomposing** the system into a **series of subsystems**, each of which contains components connected either **in series or in parallel**

Example 03



- Since this component is denoted by “A” in the diagram, we will express this probability as $P(A) = 0.995$. Assume that the other process components have the following probabilities of functioning successfully during a one-day period: $P(B) = 0.99$, $P(C) = P(D) = P(E) = 0.95$, $P(F) = 0.90$, $P(G) = 0.90$, $P(H) = 0.98$. Assume the components **function independently**.

Find the probability that the process functions successfully for one day

| References

- Statistics for Engineers and Scientists, Fourth Edition, William Navidi
Colorado School of Mines
- Khan Academy