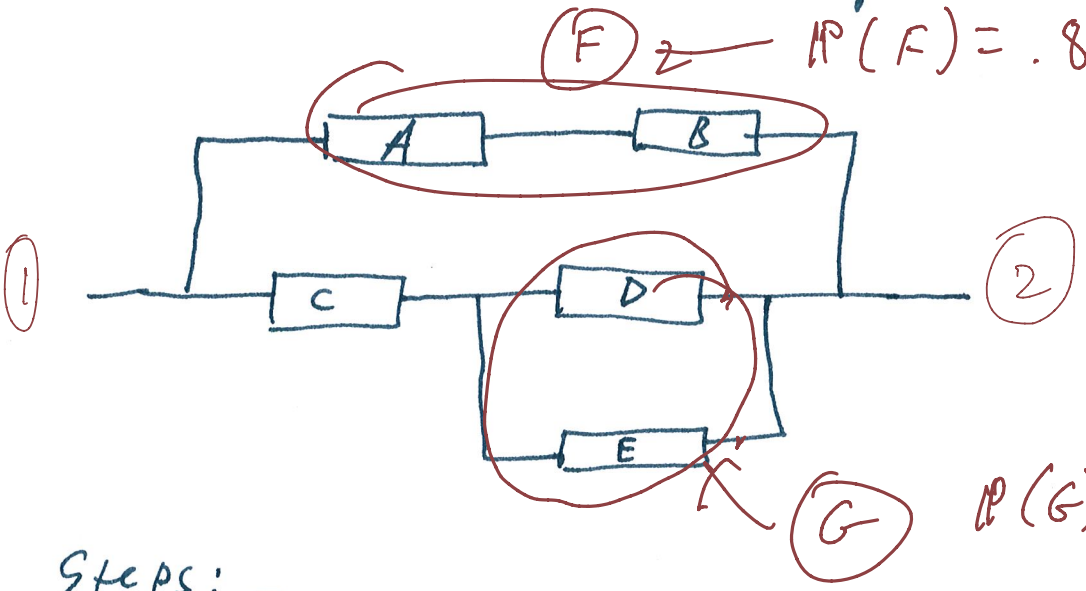
Reliability of combined Systems

Ex Each component in the system below works with probability .92 independently of other components. Calculate the system's reliability.



$\mathbb{P}(F) = .8464$

$\mathbb{P}(G) = .9936$

Steps:

1.) The upper link $A \longrightarrow B$ works if both A and B work (Series). Replace the link with component F that operates with probability: $\mathbb{P}(A \wedge B) = \mathbb{P}(A) \cdot \mathbb{P}(B)$

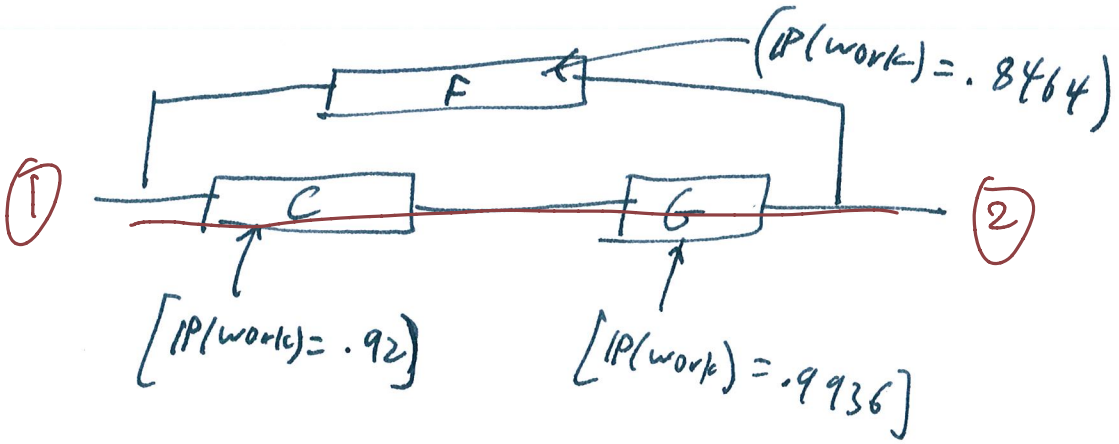
$= (.92)^2 = .8464$

2.) Components D and E are connected in Parallel and can be replaced by component G that operates with probability:

$$\mathbb{P}(D \vee E) = 1 - \mathbb{P}(\bar{D} \wedge \bar{E})$$

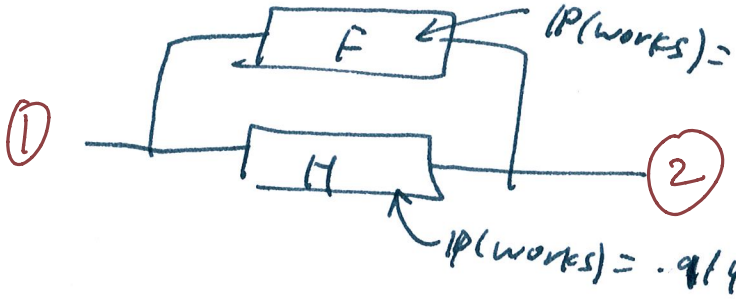
$$= 1 - [\mathbb{P}(\bar{D}) \cdot \mathbb{P}(\bar{E})] = 1 - [.08^2] = .9936$$

Now we have the following



3.) C to G can be replaced by H that works connected in series with probability: $IP(C \cap G) = (.92)(.9936)$

$= .9141$



4.) Lastly, F & H are connected in parallel and thus the reliability of the system is: $IP(F \cup H) = 1 - IP(\bar{F} \cap \bar{H})$

$= 1 - [IP(\bar{F}) \cdot IP(\bar{H})]$

$= 1 - [(1 - .8464)(1 - .9141)]$

$= \boxed{.9868}$