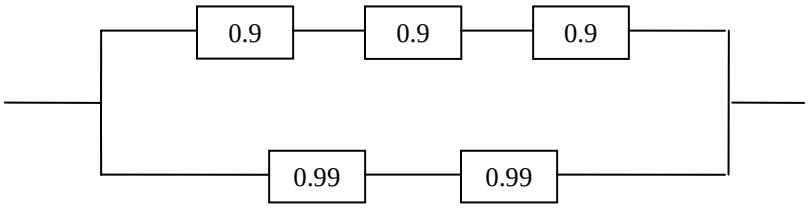
Stat 345-002 Spring 2006 2/2/06 Name (Print!)_____KEY_____
Quiz 2

Show your work if you wish to receive credit.

1. The following circuit operates if and only if there is a path of functional devices from left to right. The probability that each device functions is as shown. Assume the probability that a device is functional does not depend on whether or not other devices are functional. What is the probability the device operates? Justify all your calculations.



Solution:

Let $T_i =$ Event Top Device i functions, $i = 1,2,3$. The top path is available if the event $T = T_1 \bigcap T_2 \bigcap T_3$ occurs. Similarly let $B_i =$ Event Bottom Device i functions, $i = 1,2$. The top path is available if the event $B = B_1 \bigcap B_2$ occurs. By independence
$P(T) = P(T_1 \bigcap T_2 \bigcap T_3) = P(T_1)P(T_2)P(T_3) = (0.9)^3 = 0.729$ and
$P(B) = P(B_1 \bigcap B_2) = P(B_1)P(B_2) = (0.99)^2 = 0.9801$. A functional path exists if the event $T \bigcup B$ occurs.
$P(T \bigcup B) = P(T) + P(B) - P(T \bigcap B) = P(T) + P(B) - P(T)P(B) = 0.729+0.9801-0.7144929=0.9946071$
The step $P(T \bigcap B) = P(T)P(B)$ is justified by independence.

2. Samples of laboratory glass are in small, light packaging or heavy, large packaging. Suppose that 2% and 1% of the samples shipped in small and large packages, respectively, break during transit. If 60% of the samples are shipped in large packages and 40% are shipped in small packages, what proportion of samples break during shipment? Show your work and be complete.

Solution: This is problem 2.76, and the solution is posted with other solutions for Section 2.5.