ECE 3100 **RECITATION PROBLEMS III** **Spring 2019**

1. A problem on a multiple-choice exam has four choices. A student knows the correct answer with probability 1/2, and in that case he picks it. With probability 1/4 he can eliminate exactly one incorrect choice, in which case he picks uniformly at random from among the remaining three choices. Otherwise, he picks uniformly at random from among the four choices. What is the probability that he knew the answer given that he makes the correct choice?

2. Suppose a certain courtroom judge makes a correct ruling with probability p. Meanwhile, a three-person jury has the following properties. The three members of the jury make their decisions independently; two members make the correct decision with probability p; the third flips a fair coin to make her decision; and the jury renders its ruling by majority rule. Which of the judge or the jury has a higher probability of ruling correctly?

3. (Problem 1.36 in the book) A power utility can supply electricity to a city from n different power plants. Power plant k fails with probability p_k for $1 \leq k \leq n$, and plants fail independently of each other.

(a) Suppose that any one plant suffices to power the entire city. What is the probability that the city will experience a blackout?

(b) Suppose instead that at least two power plants need to be up and running for the city to avoid a blackout. What is the probability of a blackout in this case?

4. Under what circumstances, if any, can an event be independent of itself?

5. Gandalf and Saruman play a match consisting of a series of games. The match ends when one of the players has won two more games than the other player. The results of the games are independent of each other, and in any given game Gandalf wins with probability p and Saruman with probability $1 - p$. What is the probability that Gandalf wins the match?