LSU EE 4720 **Homework 5** **Due: 24 April 2009**

Problem 1: Solve Fall 2008 Final Exam Problem 3.

Problem 2: Continue to consider the systems and code from Problem 3.

(*a*) What is the warmup time of the local predictor on branch B2?

(*b*) What is the warmup time of the global predictor on branch B2?

Problem 3: Continuing still with Problem 3, suppose the number of iterations of the `B1` loop could be 1, 2, or 3, the probability of each number of iterations is $\frac{1}{3}$ and the number of iterations is independent of everything. The patterns of `B1` for an iteration of `BIGLOOP` can thus be `N` or `T N` or `T T N`.

(*a*) What is the accuracy of the bimodal predictor on `B1`. An exact solution is preferred but an approximate solution is acceptable. *Hint: Model the effect of the change of one* `BIGLOOP` *iteration on the counter using a Markov chain, something you may have learned about in other courses.*

(*b*) How will `B1`'s behavior impact the accuracy of the local predictor on branch `B2`? Show an example of execution that would result in a `B2` misprediction and compute the probability of that particular execution.

(*c*) Optional: Find the exact prediction accuracy of `B2` on the local predictor with `B1`'s new behavior. This may be very difficult so don't spend too much time on it.