MEMORY SYSTEM MODELLING

Following is the statement of the problem we have discussed in the class.

> Consider a two level cache denoted as M1 and M2. We consider modeling an interaction between the system (CPU, in general) with these two cache memories. Our working model is as follows. We consider an access to be successful (a hit) whenever a desired word can be found in one the memory modules. A particular page replacement *algorithm A* is designed to improve the memory system performance. In the steady state, *algorithm A* is observed to guarantee a constant miss rate, denoted by LAMBDA(i), i=1,2, for the respective memory modules.
>
> We are interested in computing the probability that algorithm A and hence, the system, will continue to achieve hits for all the accesses. [Equivalently, compute the probability that this two level cache memory system will fail to deliver the desired word.
>
> **P(NAM >= n):** Probability that the Number of Accesses to the first Miss (NAM) is greater than or equal to n, i.e., the probability that there will be no misses over n number of accesses

Some assumptions:

- We assume that the required word/byte/page exist in one of the modules;
- Constant miss rate / variable miss rate;
- Neglect the possibility of misses in both the modules for the current access when both modules had the datum in the preceding access. This assumption is crucial in our modeling as will be shown now.

[The solution to the above problem has been rigorously discussed in the class]