AML5103 | Applied Probability and Statistics | Lab Exam-1

1. Suppose you are the head of a team that comprises 5 newly recruited software engineers. All 5 of them are equally skilled and are working on a major project under your guidance for which each one of them works on their respective code modules and merges it with the master project code. All modules have identical workloads. This merger happens on a weekly basis after which you compile the master project code. During a particular week's check, you find 5 compilation errors when compiling the master project code, with 4 of those errors tracing back to the module submitted by software engineer-1. The other software engineers thereafter call software engineer-1 "clumsy." However, software engineer-1 claims that it was just bad luck and that any of them could have had their modules resulting in 4 out of the 5 compilation errors that you saw. As the team lead, the challenge for you here is to see if software engineer-1 has some valid statistical support for their position. To that end, you, as the team lead, first hypothesize that software engineer-1 is *not* clumsy. This means, you assume that any of the 5 software engineers' modules is equally likely to result in a compilation error. Under this hypothesis, using simulation calculate the probability that accused software engineer-1 submits a module that leads to *at least* 4 of the 5 compilation errors when compiling the master project code. Using the resulting probability, settle the claim as to whether software engineer-1 is clumsy as their colleagues are accusing or actually not.

2. Consider the following model for a bus-ridership analysis:

   - at each one of the stops stop, each passenger is likely to get off the bus independent of others with the following chances: 80% for stops 1, 2, 3, 8, 9, 10 and 20% for the remaining stops;
   - at every stop, there is a 50%/40%/10% chance of 0/1/2 passengers getting on board;
   - the bus never gets full; new passengers at any stop can always be accommodated;
   - bus is empty when it arrives at the first stop.

   Calculate using simulation the probability that the bus is empty after visiting the tenth stop.