1. What aspects of program behavior are most predictable? Why?

2. Explain the advantages and drawbacks of instrumentation-based and sampling-based mechanisms of collecting profiles.

3. Partition the profiled program flow-graph in Figure 1 into traces and superblocks (with duplication).

![Profiled program control-flow graph]

Figure 1: Profiled program control-flow graph

4. Given the below piece of code, perform the following transformations maintaining correctness as well as compatibility:
   a. Move instruction #3 below the branch in instruction #4.
   b. Move instruction #7 above the branch in instruction #4.
   c. Move instruction #3 above instruction #2.
   d. Move instruction #2 above instruction #1.

   1. \( R3 = R3 + 3 \)
   2. \( \text{mem}(R1) \leftarrow R5 \)
   3. \( R7 = R2 \times 4 \)
   4. \( \text{Br L2 if R2 == 0} \)
   5. \( \text{L1: } R2 = R2 + 1 \)
   6. \( \text{goto L3} \)
   7. \( \text{L2: } R2 = R2 + 2 \)
   8. \( \text{L3: } \ldots \)