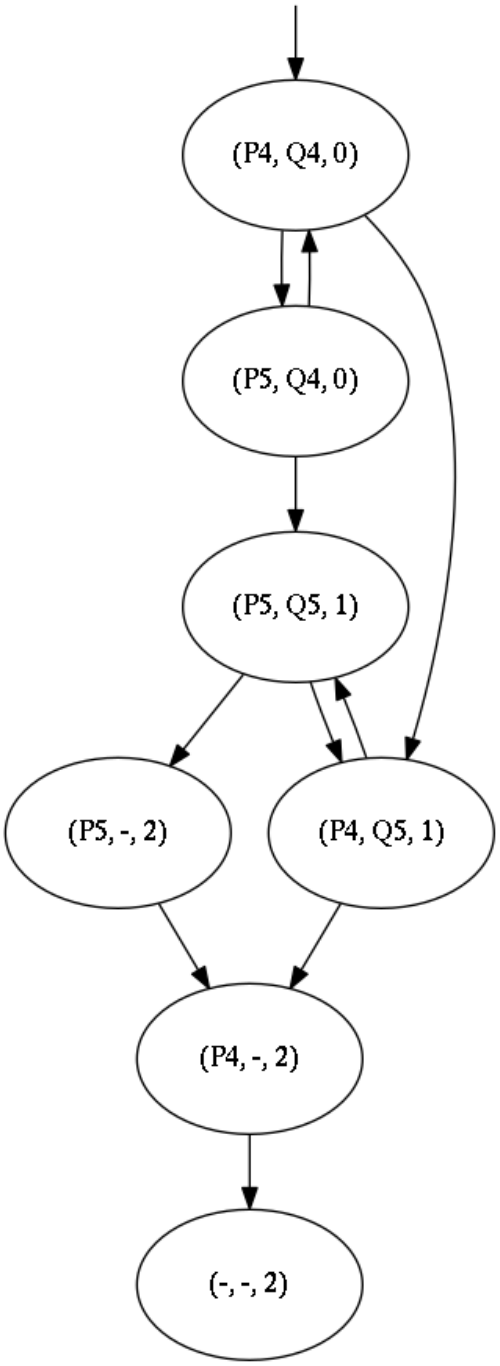
Trevor Miranda

CS 511: Homework Assignment #1

Exercise 1

1.



Trevor Miranda

CS 511: Homework Assignment #1

2. The traces for the given sequences:
    a. Sequence 012: -> (P4, Q4, 0) -> (P5, Q4, 0) -> (P4, Q4, 0) -> (P5, Q4, 0) -> (P5, Q5, 1) -> (P4, Q5, 1) -> (P5, Q5, 1) -> (P5, -, 2) -> (P4, -, 2)
    b. Sequence 002: -> (P4, Q4, 0) -> (P5, Q4, 0) -> (P4, Q4, 0) -> (P5, Q4, 0) -> (P4, Q4, 0) -> (P4, Q5, 1) -> (P5, Q5, 1) -> (P5, -, 2) -> (P4, -, 2)
    c. Sequence 02: -> (P4, Q4, 0) -> (P5, Q4, 0) -> (P4, Q4, 0) -> (P5, Q4, 0) -> (P5, Q5, 1) -> (P5, -, 2) -> (P4, -, 2)

3. Two does not necessarily have to appear in the output. If Thread P is stuck on its first instruction as Q continues to execute, you reach (P4, -, 2) where (while n < 2) fails to be true, which results in Thread P exit without printing 2. This is one counterexample, there are more paths that result in 2 not being printed at all.

4. Two can only appear once in the output. There is no cycle present for the state where Thread P is at the print instruction and Q has also incremented n to 2. The only way is forward to the end of program execution.

5. One can appear an infinite amount of times as there is a cycle between the states (P5, Q5, 1) and (P4, Q5, 1). Otherwise stated: there is a loop where Thread Q does not progress but Thread P does, resulting in an infinite print loop that will only print 1 as Thread Q is not executing.

6. Zero can also appear an infinite amount of times as there is another cycle between the starting state (P4, Q4, 0) and (P5, Q4, 0) which can result in the printing of infinite zeroes.

7. The shortest sequence that can be outputted is of length 1. An example trace to reach that conclusion: -> (P4, Q4, 0) -> (P5, Q4, 0) -> (P5, Q5, 1) -> (P5, - , 2) -> (P4, -, 2)