Operating Systems CS 4410
A2 Part 1
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1. Mutual Exclusion for Three
    a. Mutual exclusion will be satisfied if A0, A1, or A2 does not allow more than one thread in the critical section at the same time. We would need to prove that the value for i is different for all three of them.
        i. !(A0 & A1) && !(A1 & A2) && !(A0 & A2)
    b. {Ai} = (turn == i)
    c. Entry/exit protocol for a solution to the critical section need to have mutual exclusion, fairness, and performance or progress. The current solution ensures mutual exclusion, in this case non-blocking is not satisfied because it is not explicitly stated that NCS will terminate at one point. If the process is in NCS forever, it will block itself from going into the CS again, and therefore block all other processes once that situation arises.
2. The Swap Instruction
    a. Entry and Exit protocol
        S = false, L = true
        i. Entry protocol:
            $\{I\}$
            $while\ l_1\ do\ \{I\ ^\wedge\ l_1\} swap\{s, l_1\}$
            $\{I\ ^\wedge\ \neg l_1\}$
            CS
        ii. Exit protocol:
            $\{I\ ^\wedge\ \neg L_1\}\ swap\{s, l_1\}$
            $\{l_1 = l_2 = \ l_3 = \ l_n = true\ ^\wedge\ I\}$
            $\{S_i = false\}\{I\}$
    b. Invariant
        I = At most one of l1, l2, … ln is false ^ (i^ in (CSi) $\rightarrow \neg l_1$)
        Proof that I suffices to establish mutual exclusion (assuming I is invariant)
        in (CS1) ^ in (CS2) ^ I
        $\neg l_1$ ^ $\neg l_2$ ^ At most one … is false
        False

Part 2

1.1 c
1.3 d
1.4 b
1.5 a
1.6 c
1.7 e