Stamatios Morellas
COM S 352 - Homework 7
Due 3/13/20 @ 11:59pm

8.12 (10 points)

Part a.

The four necessary conditions for deadlock are:

1. Mutual Exclusion → resources involved must be unsharable or else the processes would not be prevented from using the resource when necessary
2. Hold and Wait (partial allocation) → processes must hold previously-allocated resources while waiting to receive their requested resources
3. No Preemption → processes must not have resources taken away from them while in use
4. Circular Wait → processes wait in a circular chain such that each process waits for requested resources from another process in front of it.

Mutual exclusion: cars (processes) are able to occupy a **specific space** on a given street.

Hold and wait: cars are **waiting** for the streets to open up so they can move on from the current position that they are **holding**.

No preemption: a space occupied by a vehicle **cannot be taken away from it**.

Circular wait: vehicles are **waiting in a circle** for the vehicles in front of them to move but they must all move at the same time since there is no room that cars are able to fill in the circle.

Part b.

Each vehicle moving on the street must ensure that it has the freedom to move onto the next street without stopping at an intersection. This is how it will avoid deadlock.

8.16 (6 Points)

The CPU scheduler plays the role of selecting which process will run first. The program will not lead to deadlock if thread_one is scheduled before thread_two. Thread_one must acquire the mutex locks before thread_two.

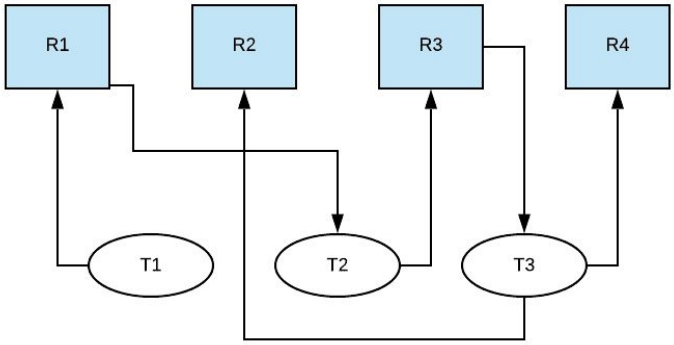
8.18 (8 Points)

b) T1 is waiting for resource 3 but it is allocated to T3, which is waiting for T1, resulting in deadlock.

d) We see the “circular wait” condition for this scenario.

f) This results in deadlock too because resource 2 is allocated to 3 processes.

8.22 (6 Points)



8.24 (5 Points)

When a philosopher makes the initial request for a chopstick, he should not satisfy the request until there is no other philosopher with two chopsticks. This way, deadlock can be prevented.

8.28 (15 Points)

a) A safe order for the threads to sequence in is:

$$T2 \rightarrow T3 \rightarrow T0 \rightarrow T1 \rightarrow T4$$

b) Yes.

c) Yes.