1.Describe the asymmetric solution. How does the asymmetric solution guarantee the philosophers never enter a deadlocked state?

The asymmetric solution alternates which chopstick is unlocked first in an attempt to avoid deadlocks and avoid the case of (every philosopher is waiting for the chopstick on their right to be released while they hold the one on their left). This alternation is controlled solely by whether the philosopher releasing the chopstick has an even or odd numbered id. This prevents deadlocked states because the cyclical deadlock from always releasing the same chopstick first cannot occur because the chopstick released is determined by the id of the philosopher and prevents the all-left or all-right return outcome.

2.Does the asymmetric solution prevent starvation? Explain.

The asymmetric solution does not prevent starvation. However, so long as the Philosopher's actions are fairly random, starvation is less likely.Bbecause of the randomness, philosophers should generally get the same amount of time to eat and no philosopher should starve.

3.Describe the waiter's solution. How does the waiter's solution guarantee the philosophers never enter a deadlocked state?

The waiter uses a waiter mutex and a condition variable for can_eat which is controlled by the value of left_chopstick_available and right_chopstick_available. Each philosopher attempts to get the waiter, if they get it then check to see if they have a left and right chopstick available. If they have their chopsticks they mark them as being in use and release the waiter then begin to eat. Once they are finished, they re acquire the waiter and release their chopsticks. Finally, the philosopher signals the philosophers to either side of it that their chopsticks are no longer in use.

4.Does the waiter's solution prevent starvation? Explain.

No, while the waiter's solution allows only one philosopher to pick up or put down chopsticks at a time, for a philosopher to pick up their chopsticks they must be able to pick up both chopsticks. While the philosopher has the waiter, other philosophers may be eating and using the chopsticks the philosopher being waited on needs to be able to pick up both of their chopsticks and begin eating. Because of this it is possible for one philosopher to starve if they just never have access to both chopsticks at the same time.

5.Consider a scenario under a condition variable based solution where a philosopher determines at the time it frees its chopsticks that both chopsticks of another philosopher (Phil) it shares with are free, and so it sends the (possibly) waiting Phil a signal. Under what circumstances may Phil find that both of its chopsticks are NOT free when it checks?

In the event that a different philosopher claims one of phil's chopsticks between when the first philosopher checks and when phil checks, phil's chopsticks will not be free when phil checks.