1. In the bank account problem with 3 processes from lecture:

(a) What is the highest value that semaphore MUTEX can reach?

(b) What is the smallest value that semaphore MUTEX can reach?

2. In the bounded buffer problem from lecture:

(a) What are the possible values of PUT_ITEM and TAKE_ITEM semaphore (counters), when two items are found in the buffer?

(b) Is it possible for PUT_ITEM and TAKE_ITEM to be both one at the same time? How many items may there possibly be in the buffer?

3. Suppose that the buffer can hold 5 items and PUT_ITEM is initialized to 5.

(a) What are the possible values of PUT_ITEM and TAKE_ITEM semaphore (counters), when two items are found in the buffer?

(b) Is it possible for PUT_ITEM and TAKE_ITEM to be both one at the same time? How many items may there possibly be in the buffer?

4. In the FGH problem (See requirements in lecture slide):

| | | |
|---|---|---|
| loop<br>F_one<br>V(Sem1)<br>V(Sem1)<br>P(Sem2)<br>P(Sem3)<br>G_one<br>H_one<br>endloop | loop<br>F_two<br>V(Sem2)<br>V(Sem2)<br>P(Sem1)<br>P(Sem3)<br>G_two<br>H_two<br>endloop | loop<br>F_three<br>V(Sem3)<br>V(Sem3)<br>P(Sem1)<br>P(Sem2)<br>G_three<br>H_three<br>endloop |

All 3 semaphores are initialized to zero.

(a) Is it possible for Sem1 to reach -2 (minus) at the same time Sem2 reaches +2? Explain your answer.

(b) Is it possible for both Sem1 and Sem2 to reach +2 at the same time? Explain your answer.

(c) What are the values of the 3 semaphores when the first of the G functions is executed? Explain.

(d) Can any semaphore be negative when the first of the H functions is executed? Explain.

5. Consider this alternative solution of the FGH problem:

| | | |
|---|---|---|
| loop<br>F_one<br>V(SemA)<br>P(SemB)<br>G_one<br>H_one<br>endloop | loop<br>F_two<br>V(SemA)<br>P(SemB)<br>G_two<br>H_two<br>endloop | loop<br>F_three<br>V(SemB)<br>V(SemB)<br>P(SemA)<br>P(SemA)<br>G_three<br>H_three<br>endloop |

(a) What would be the appropriate initial values for the semaphores?

(b) Is it possible for SemA counter to reach +2? What would this value denote?

(c) Is it possible for SemA counter to reach -2 (minus)? What would this value denote?

(d) Can G_one function executes before F_two function finishes?

6. (blank)