

Homework 10

Problem 1

Using the progress graph in Figure 12-21 of file “**badcnt.c**”, draw the following trajectories out and point out the value of **cnt** after the execution (assume the value of **cnt** is 0 initially for each trajectory).

- A) H1, L1, H2, L2, U2, U1, S2, T2, S1, T1
- B) H2, L2, U2, H1, S2, L1, T2, U1, S1, T1
- C) H1, L1, U1, H2, L2, S1, U2, S2, T1, T2
- D) H1, H2, L1, U1, S1, L2, U2, T1, S2, T2

Problem 2

```
#include "csapp.h"
#define N 4

void *thread(void *vargp) {
    int myid = *((int *)vargp);
    printf("in thread %d\n", myid);
    return NULL;
}

int main() {
    pthread_t tid[N];
    int i, *ptr;

    for (int i = 0; i < N; i++) {
        ptr = Malloc(sizeof(int));
        *ptr = i;
        // Create a thread running thread with argument ptr
        // Your code here

        Free(ptr);
    }
    // Join all threads
    // Your code here
}
```

1. Complete the previous code according to the comment.
2. Is there any race condition in the previous code? Why or why not?

Problem 3

Consider the following three functions, please point out whether they are thread safe or not and whether they are reentrant or not.

```
int t;

void swap1(int *x, int *y)
{ t = *x; *x = *y; *y = t; }

void swap2(int *x, int *y)
{ P(&mutex); t = *x; *x = *y; *y = t; V(&mutex); }

void swap3(int *x, int *y)
{ int t; t = *x; *x = *y; *y = t; }
```

Problem 4

Can the following program have dead lock? Try to explain your answer using progress graph.

T1	T2
P(a)	P(c)
P(b)	P(b)
V(a)	V(b)
P(c)	P(a)
V(b)	V(c)
V(c)	V(a)