Thread Quizzes

Exercise

Consider the following statement: "If one thread terminates, all other threads in the process will necessarily terminate." Indicate in which circumstances among the following ones the previous statement is correct. Note that incorrect answers imply a penalty in the final score

Choose one or more options:

1. ☐ When the thread performs a return from its start function.
2. ☐ When the thread performs and exit.
3. ☐ When the thread performs a return from the main.
4. ☐ When the thread receives a pthread_cancel from another thread.
5. ☐ When the thread performs a pthread_exit.

Correct Answers: 2. 3

Exercise)

Explain why:

1. Two processes can or cannot share a global variable.
2. Two threads can or cannot share a global variable.

Answer:

1. During the generation of a new process, for instance by means of the system call fork(), the address space is duplicated and therefore disjoint.
2. Threads share the same address space, as a consequence a write operation on a global variable by means of a thread has effect on all the other threads

Exercise

In a relatively unloaded multiprocessor system (where response times are fast), what does the following fragment of code produce on standard output?

```
int i=0; pthread_t thread, thread2;
void *t1(void *a){
      pthread_detach (pthread_self ());
      printf ("%d", ++i);
      return NULL;
}

void *t2(void *a){
      sleep(1);
      printf ("%d", ++i);
      return NULL;
}

int main() {
      if(fork())
            pthread_create (&thread, NULL, t1, NULL);
      sleep(1);
      if(fork())
            pthread_create (&thread2, NULL, t2, NULL);
      printf("A\n");
}
```

Choose JUST ONE option:

1. ☐ AA
2. ☐ 1AAAA
3. ☐ 12AAAA
4. ☐ AAAA
5. ☐ 1AA
6. ☐ 12AA

Correct Answers: 2

Exercise

A multi-threaded program consists of several threads. Thread A executes an exit() before terminating, thread B a pthread_exit(), and thread C a return.
Indicate which of the following statements are correct. Note that wrong answers imply a penalty in the final score.

Choose one or more options:

1. ☐ In order not to terminate the other threads, the exit() must be performed only by the initial function of the thread (e.g., main())
2. ☐ All other threads end with thread B
3. ☐ All other threads end with thread C
4. ☐ In order to terminate, thread C must perform the return from its initial function of the thread (e.g., main())
5. ☐ All other threads end with thread A

Correct Answers: 4, 5

Exercise

Suppose to execute the following program with the value 4 passed on the command line. Report the output generated by the program. Please, report the response on a single line, indicating the various messages and output values separated by a single space. Do not insert any other character into the answer. Format errors will be treated in the same way as other errors. This is an example of a correct answer: 2 5 0 3

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <pthread.h>

pthread_t thread;
int i;

void *t1 (void *a){
      int *p;
      p = (int *) a;
      i = *p;
      pthread_detach (pthread_self ());
      printf ("%d ", i);
      i--;
      if (i>0)
            pthread_create (&thread, NULL, t1, (void *) &i);
      return NULL;
}
```

```
int main(int argc, char **argv) {
      i = atoi (argv[1]);
      if (fork())
            pthread_create (&thread, NULL, t1, (void *) &i);
      sleep (1);
      printf ("%d ", -i);
}
```

Answer:
```
4 3 2 1 0 -4
```

Exercise

Analyze the following piece of code.
Please indicate which of the following statements are correct. Note that incorrect answers imply a penalty in the final score.

```
void *thread_main(void *p) {
      int x, *y;
      y = (int *)p;
      x = *y;
      x += x;
      *p = x;
      return NULL;
}

int main() {
      int data = 1;
      pthread_t one, two;
      pthread_create(&one, NULL, thread_main, &data);
      pthread_create(&two, NULL, thread_main, &data);
      pthread_join(one, NULL);
      pthread_join(two, NULL);
      printf("%d\n", data);
      return 0;
}
```

Choose one or more options:

1. ☐ The code contains a race condition
2. ☐ The code does not contain a race condition
3. ☐ The value 1 can be printed
4. ☐ The value 0 can be printed
5. ☐ The value 4 can be printed
6. ☐ The value 2 can be printed

Correct Answers: 1, 5, 6

Exercise

Analyze the following segment of code.
Please indicate which of the following statements are correct. Note that incorrect answers imply a penalty in the final score.

```
void* myfunc(void* ptr) {
```

```
	int *tidP, data;
	data = (int *) ptr;
	printf("%d ", data);
	return NULL;
}
int main() {
	int i, x;
	void *retval;
	pthread_t tid[10];
	for (i=0; i<10; i++) {
		pthread_create(&tid[i], NULL, myfunc, (void *) &i);
	}
	for (x=0; x<10; x++) {
		pthread_join (tid[x], &retval);
	}
	pthread_exit(NULL);
}
```

Choose one or more options:

1. ☐ The code can display the sequence: 1 2 3 4 5 6 7 8 9 11
2. ☐ The code contains a race condition
3. ☐ The code can display the sequence: 1 2 3 4
4. ☐ The code does not contain a race condition
5. ☐ The code can display the sequence: 1 2 3 4 5 6 7 8 9 10
6. ☐ The code can display the sequence: 1 7 8 8 8 8 8 8 8 10
7. ☐ The code can display the sequence: 0 1 2 3 4 5 6 7 8 9

Correct Answers: 2, 5, 6, 7

Exercise

Suppose a thread executes the following instruction:

```
pthread_detach (pthread_self ());
```

Which among the following observations are correct (possibly more than one). Note that incorrect answers may imply a penalty on the final score.

Choose one or more options:

1. ☐ The thread that executed this instruction CANNOT perform a pthread_join.
2. ☐ The thread that created this thread CANNOT perform a pthread_join (with tid related to the thread that executed the instruction pthread_detach).
3. ☐ The thread that executed this instruction CANNOT perform a pthread_create.
4. ☐ The status information will be lost at the termination of the thread.
5. ☐ The thread that executed this instruction CANNOT perform a pthread_exit.

Correct Answers: 2, 4

Exercise

Analyze the following segment of code.

Indicate which is the output generated by the program. Note that incorrect answers imply a penalty in the final score.

```
#include <stdio.h>
```

```
#include <pthread.h>

void *t2 ();
int n = 5;
int m = 3;
void *t1 (){
      pthread_t thread;
      if (n>0) {
            printf ("%d ", n--);
            pthread_create (&thread, NULL, t2, NULL);
      }
      pthread_join (thread, NULL);
      pthread_exit (NULL);
}

void *t2 (){
      pthread_t thread;
      if (m>0) {
            printf ("%d ", m--);
            pthread_create (&thread, NULL, t1, NULL);
      }
      pthread_join (thread, NULL);
      pthread_exit (NULL);
}

int main (int argc, char *argv[]) {
      pthread_t thread;
      setbuf (stdout, 0);
      pthread_create (&thread, NULL, t1, &n);
      pthread_join (thread, NULL);
      return 1;
}
```

Choose JUST ONE option:

1. ☐ 3 2 1 5 4 3 2
2. ☐ 5 3 4 2 3
3. ☐ 5 3 4 2 3 1 2 0 1
4. ☐ 5 3 4 2 3 1 2
5. ☐ 5 4 3 2 3 2 1

Correct Answers: 4

Exercise

Indicate which of the following statements related to threads are correct. Note that incorrect answers imply a penalty in the final score.

Choose one or more options:

1. ☐ To communicate threads can use global variables.
2. ☐ The function pthread_join() waits the termination of a specific thread whose identifier is passed as a parameter to the function.
3. ☐ Each thread with the exception of the thread with tid=0 has a parent.

4. ☐ The parallel execution of an algorithm by means of more than one thread leads IN ANY CASE to a reduction on its execution time.
5. ☐ The function pthread_exit() executed by one thread leads to the termination of the only thread that executes it.
6. ☐ The instruction return executed by one thread leads IN ANY CASE to the termination of the whole process.

Correct Answers: 1, 2, 5

Exercise

In the following code snippet, the main program creates N threads that execute the function tF. The purpose of the program is to execute the threads passing to each one an integer value that uniquely identifies the thread, i.e., an integer number ranging from 0 to N-1.
Indicate which of the following observations are correct. Note that incorrect answers imply a penalty in the final score.

```
#define N 10
void *tF (void *par) {
  int *tidP, tid;
  ...
  tidP = (int *) par;
  tid = *tidP;
  ...
  pthread_exit (NULL);
}
int main () {
  pthread_t t[N];
  int rc, i;
  for (i=0; i<N; i++) {
      rc = pthread_create (&t[i], NULL, tF, (void *) &i);
      if (rc) {
      fprintf (stderr, "Error.\n");
      exit (1);
   }
 }
  pthread_exit (NULL);
}
```

Choose one or more options:

1. ☐ The variable tid can contain the value 10 for one thread.
2. ☐ The variable tid contains a different integer value for each thread.
3. ☐ The variable tid can contain the value 10 for all the threads.
4. ☐ The variable tid can contain the value 7 for all the threads.
5. ☐ A copy of the variable is passed to each thread.

Correct Answers: 1, 3