# Real Time and Embedded Concepts Test

The purpose of this test is to determine the level of your current knowledge in Real-Time and Embedded system programming.

First name _____
Last name _____

You don't have to know all the answers, just do your best!!!!!

Grade _____ (office use only)

## 1. Real Time Concept

1.1 Please explain what are the following concepts (use diagrams in your elaborations)

- Race condition
- Priority inversion
- On chip debugging
- Programmable interrupt controller
- Dead locks
- context switching
- data segment \ stack segment \ code segment
- Blocking mode
- Stack Overflow

1.2 What is a Scheduler, elaborate regarding scheduling algorithms?

1.3 In a system that has a critical section only one of the following can enter the critical section

- Up to 40 Reading-threads
- OR 1 writing thread

Please write down how you would implement this scenario.

1.4 What Task States do you know; please draw the task states diagram.

1.5 Explain a project's Compiling and Linking Process (use the phrase symbol table)

1.6 Please explain the Boot Loading process from when the on/off switch is turned on till the operating system is loaded.

1.7 What message-queues used for?
When are they blocked?

1.8 What is the difference between Mutexes and Binary semaphores

1.9 You have been the given a system with

- 1 high-pririty task
- 1 low-priority task

Both tasks need to use a critical section

a- What is the problem that can occur ?

b- How can we avoid that?

c - Is there a way to do it without using system calls (please write down psedo-code)

1.10 What is the difference between HW\SW Interrupts?

1.11 Given the below function

a- explain what it does

b- explain what would happen if the key word static wasn't there.

c- What would happen if this function was used in a multi-threaded environment (could x be zero ?)

d- Make changes within the function in order to protect it from race conditions.

```
int func()
{
        static int x;
        x++;
        return x;
}
```