Embedded Systems
(TE 3059)
Examen Final
Semestre Agosto – Diciembre 2020

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Instructions: **You are allowed to take out your class notes during the exam**. If the wording of your answers is the same as the class notes, you will be suspected on copying and your grade will be 10/100.

¡Good luck!

1. **(1 point) Provide a definition of a real-time embedded system.**
   An embedded system is a collection of programmable parts which interacts with the environment through some actuators, sensor, or any other inputs to perform a given task. Real time system depends also on time at which the results are produce, therefore, a real-time embedded system is a collection of proframmable parts taking on account the time.

2. **(1 point) Provide 3 advantages of designing an embedded systema vis-à-vis a hardware-only system**
   1. Lower system cost.
   2. Easy to develop.
   3. Short product development cycles.

3. **(1 point) What is the difference between an operating system and a Real-Time Operating System?**
   An Operating System (OS) is the software that handles the memory and all the processes of the computer. The embedded system is a combination of programmable parts. An OS could be use in an embedded system this would be more efficient by managing the hardware in a most efficient way but does not do specific software task, only manages the hardware resources and provides services for the software inside of an embedded system.

4. **(2 points) What is context switching in the context of a multitasking embedded system?**
   The act of reassigning a CPU from one task to another one is called context switch. This could be when an interrupt comes, and CPU needs to handle it but after it finishes need to come back to the task that it was doing.

5. **(1 point) According to you, what is the most important data memory segment and why?**
   Bss stores zero initialized and uninitialized global and static data, therefore, for me it is more important to know when I assigned a variable as 0 because it is important to the program. Also, the global variables are being used in all the code, it requires to have them on the hand all the time.

6. **(1 point) In Round-robin scheduling each task can be assigned with different time slice**
   a. True
   b. False

7. **(1 point) RMS is used to analyze the dynamic priority-based multi-tasking scheduling**
   a. True
   b. False

8. **(1 point) In RMS, the priority of a task is based on the task execution time**
   a. True
   b. False

9. **(1 point) In EDF, the priority of a task is determined on how close the task is to its deadline at run time**
   a. True
   b. False

10. **(2 points) Perform RMS analysis on this time requirement**
    Task1: execution time: 25ms, period: 50ms
    Task2: execution time: 40ms, period: 100ms

    Period T1 >= t2 + t1 ? >= 40 + 25 >= 65 ms   50 not greater or equal to 65 therefore
    Period T2 >= t1 + t2 ? 100 ms >= 65 ms T1 should have priority
    If we set high priority to Task2, Task 1 couldn't reach it's deadline.

    T1(25)T2(25) **50** T1(25)T2(15) (10) **100** T1(25)T2(25) **150 Continue the same pattern**

11. (3 points) Perform RMS analysis on this time requirement
   Task1: execution time: 3ms, period: 10ms
   Task2: execution time: 4ms, period: 15ms
   Task3: execution time: 5ms, period: 20ms

   Period T1 >= t2 + t3 +t1? >= 4 + 5 + 3 >= 12 10 not greater or equal to 12
   Period T2>= t3 + t1 + t2? >= 5 + 3 + 4 >= 12 15 >= 12
   Period T3>= t1 + t2 + t3? >= 3 + 4 + 5 >= 12 20 >= 12

   T1 should have high priority follow by T2 follow by T3

   T1(3) T2(4) (3) **10** T3(5) **15** T1(3) (2)**20** T1(3) T2(4) (3) **30 Continues the same pattern**