Real-Time Systems ECSE 531
Assignment 5: exam

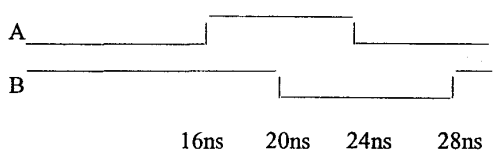
1)Your embedded system is context switching continuously between *running* tasks that are not accomplishing anything useful. What is this an example of? What if they need a resource that is unavailable to resolve the problem; what is that an example of?

2)You are building an external interrupt circuit board. The difference in impedances between two lines that connect is causing some backward echo current. Describe this backward current in terms of the initial current I coming down the line and the two impedances R_1 and R_2. Note: If the backward current reflects back due to another impedance mismatch, you have a double reflection. On the other hand, if the signal touches ground, you have a short. For a point of extra credit, which is more dangerous to a real-time system - a short or double reflection - and why?

3)Write the Schrodinger's equation for an electron in a 1-dimensional potential well of size V in terms of its wave function and total energy for a point of extra credit. For this question however, list 3 possible reasons an electron would escape this potential to enter a conduction band in a semiconductor.

4)Why use MRAM over SRAM? Give 4 quantitative reasons.

5)You have the following signals you wish to model in VHDL where B depends on A, which has a pulse with a 32 ns period.



Write an ARCHITECTURE routine to describe this **pulsed** behavior using transport delay modeling.

Real-Time Systems ECSE 511
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6)The data thruput that your uprocessor can handle has been measured to be 1 GByte/sec. The average data read/write request is 10 bytes in size. If the cache can be accessed in 10 nsec and the main memory accessed in 100 nsec, what is your cache hit rate?

7)In question 6, it has been determined that the jitter in your processor's performance is due to inexact number of bytes that are transferred per hit in the cache. Specifically, there is a 10 byte +/- 2 byte spread in your average data transfer. What is the jitter due to this spread?

8)In question 7, the total jitter in the real-time system is 4 nsec. What is the total jitter due to all contributions not counting the cache contribution?

9)What are the 3 general types of embedded systems, and what is the advantage of each?

10)I have a critical section of memory that is utilized in parallel by 2 independent tasks. What do I use to protect this memory from a race condition?