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Rename the completed Word document to *yourlastname\_Q2.docx* before emailing it to [tlupfer@sandiego.edu](mailto:tlupfer@sandiego.edu). In other words, my quiz would be named *lupfer\_Q2.docx*.

This is a closed-book, off-grid (no Internet searches) quiz. You have 20 minutes to complete it.

**Reminder**: USD Honor Code: [www.sandiego.edu/conduct/documents/HonorCode.pdf](http://www.sandiego.edu/conduct/documents/HonorCode.pdf)

**All questions are worth 4 points (26 x 4 = 104 points total)**



Is an RTOS deterministic or non-deterministic?



1. **Answer**: Deterministic

What are four general characteristics of a traditional operating system?



1. **Answer**: Large
2. **Answer**: Monolithic



1. **Answer**: Pre-configured
2. **Answer**: Nondeterministic

What are four general characteristics of an RTOS?

1. **Answer**: Compact
2. **Answer**: Modular



1. **Answer**: Configurable
2. **Answer**: Deterministic

What are two considerations that would compel you to use an RTOS instead of bare-metal state machines for an embedded design?

1. **Answer**: Large and more complex projects (since some is already done/abstracted for you)



1. **Answer**: Use of communications stacks

Are Linux, macOS, or Windows suitable for embedded applications? Explain your answer.



1. **Answer**: It depends on the application. Traditional Operating Systems can be useful for embedded applications involving networking, but are not suitable and downright dangerous for applications where lives are on the line (eg: flight control software)

What are the five main elements we will be using to develop RTOS-based applications?  
(Hint: the scheduler is not one of the answers.)

1. **Answer**: Mutexes



1. **Answer**: Threads
2. **Answer**: Semaphores



1. **Answer**: Queues
2. **Answer**: Timers



When writing an embedded application based on a preemptive RTOS, what must your threads be sure to do, with respect to lower-priority threads? See the next question before you go into too much detail with this answer.



1. **Answer**: Threads must yield control in order to be “good citizens” and allow lower priority threads to run

What is a consequence of not doing what you answered in the previous question?



1. **Answer**: Some threads simply will not be run at all

What does IoT stand for?



1. **Answer**: Internet of Things

What does cIoT stand for?



1. **Answer**: cellular Internet of Things

What does LAN stand for and what is an example of a LAN?



1. **Answer**: Local Area Network



What does WAN stand for and what is an example of a WAN?



1. **Answer**: Wide Area Network, LTE would be an example of this

What does FOTA stand for and why is it a good thing to implement in wireless embedded devices?



1. **Answer**:



What does JSON stand for and what is it used for?



1. **Answer**: JSON is used for representing organized pairs of data with a name and associated value

[BONUS] What is a very important feature that should be implemented in IoT edge devices but was an afterthought in many of the first IoT products such as home door locks that are locked and unlocked via a mobile app?

1. **Answer**: Security features

