EECE 5117C/6017C—Fall 2017 Quiz 2--Sept. 18 Name: **Djibril Sall**

**ANSWERS SHOULD BE CONCISE!**

1. (15 pts) What are the main drawbacks of parallel communication that caused serial communication to become so prominent?

In Parallel communication, the bits don’t reach the destination at the same time due to some factors like the path of resistance and length as well temperature; this limit the speed since the receiver has to wait for the data bits to arrive. Another is crosstalk (interference between two parallel lines) which creates errors in the received bits its mostly happens when the distance between the transmitter and receiver are long.

2.(5 pts) How many bits can be sent in one frame of data with UART communication?

In a UART communication usually only 8 bits can be sent in one frame of data, but depending on the device sometimes this number can be set to 10 bits.

3. (5 pts)What is the UART parity bit?

The parity bit is a bit added to the data bits in order to check for errors. It adds a 1 or a 0 to the data bits to say whether the number of 1 bits in the data is odd or even.

4. (5pts) How many lines are needed for I2C communication?

For I2C communication only 2 lines are needed: a data line and a clock line.

5. (10 pts) For I2C how does the slave device know when to send data or when it is receiving data?

A start condition is sent into the bus which set all the slaves into alert mode, then an 8 bits signal comes from the master with address of the slave device needed with an extra 1 bit which specify the operation needed from the slave: write or read operation.

6. (20 pts) Explain when you would use each of the three serial communication protocols discussed in the tutorial..

I2C can be used when we have several sensors that don’t require a high throughput. It’s also capable of having more than one master on one set of I2C lines.

SPI can be used when we don’t have several peripherals, it’s also good to use with sensors that have a very specific command structure.

TTL-UART: should be used when the transmitter and receiver are far apart (long distance). Its long distance capability is why it’s used by microcontroller Bluetooth and GPS peripheral modules.

7. (10 pts) How are services and their characteristics distinguished in the BLE protocol?

In BLE protocol each service and its characteristics is distinguished by a unique identifier called a UUID which is a 16 bit attribute.

8. (10 pts) When first setting up a new microcontroller, how do you know if it is compatible with a sensor that you already have?

In order to know if a sensor we already have is compatible with the new micro-controller we need to check if the microcontroller has connection ports or inputs compatible with the sensor, check the operating conditions (voltage other physical parameters) and finally check the communication protocol and check if it’s supported by the new microcontroller.  If these conditions are met the sensor shouldn’t have any problem to connect to the microcontroller.

9. (20 pts) When using UART and communication doesn’t seem to be working properly, what things should be checked and in what order? Explain.

Check if the UART is correctly wired.

Check if the UART is compatible with the system: if they use the same signaling scheme and voltage level.

Check the configuration setting: number of start and stop bits, number of data its, parity and baud rate.

Check if there is any error flag asserted like overrun errors or parity bit errors.

Check if the flow control is correctly configured.

Test and debug the control logic code system.

Check if there is a hardware issue between in any of the UARTs.