

Quiz

Note: It is recommended that you save your response as you complete each question.

Question 1 (10 points)



You have been give the responsibility of optimizing the energy usage of a new Bluetooth peripheral device. The following information on the settings of the Bluetooth stack is known.

/* Bluetooth advertising peripheral is x units times 0.625mS */

/* Connection Interval is x units times 1.25mS */

/* Slave Latency is available from 0 to 100 units */

/* TX power is available at -20, -10, -3, 0, +3, +5, and +8db */

Marketing has requested that the Bluetooth device connection with a client should feel quick to the user experience which they defined as no more than 500mS. What should the Advertising Interval be set to?

800 units



The input sensor data that needs to be provided to the client from the Bluetooth sensor can arrive every 65.0mS. The client must confirm that the Bluetooth device is active every 0.75 seconds. What should the connection interval be set to?

600 units



What should the Slave Latency be set to?

52 units



Based on the slave latency and providing the minimum number of connection attempts to connect to the client to prevent a Supervisory Timeout, what should the Supervisory Timeout be set to in terms of milli-seconds?

3.445 s



This new Bluetooth device is a on a bluetooth lightbulb, so the distance can be considered far away. The goal is to minimize transmission power. If the Path Loss is 80 and a maximum acceptable RSSI is -75 is acceptable, what should the TX power should be used?

5db



To set TX power, you should use a callback routine from a

gap or gatt event or set before ble_init?

set before ble_init



Save

Question 2 (2.25 points)



In a low energy microcontrollers, which operations to FLASH are relatively high current / energy? (select all that apply)

☐ memory retention

☐ read operations

☒ write operations

☒ erase operations

Save

Question 3 (2.25 points)



Energy Harvesting solutions must overcome generating

erratic



(single word answer) voltages

and

intermittent



(single word answer) power.

Save**Question 4** (2.25 points)

Match the Bluetooth Smart use of the following terms to their definition.

2 ▼

the assignment of permission to do something

1. Authentication

1 ▼

a way to prove that the device is actually the device it claims to be.

2. Authorization

4 ▼

the intent to keep something secret.

3. Integrity

3 ▼

the internal consistency and lack of data corruption.

4. Confidentiality

Save**Question 5** (2.25 points)

Select all the security best practices that would have prevented the Onity Door Lock security hack.



User's must update the default password upon installing the equipment



Firmware patches should be done automatically and remotely without the owner's intervention or new hardware



User's must update the default user name to something other than an email address



Debug ports should not be exposed or enabled once the product is released into production

Save**Question 6** (2.25 points)

In a public key encryption, the



(single word answer) key is used for decryption.

Save**Question 7** (2.25 points)

In loops that are accessed frequently, small functions should be changed into in-line functions.



True



False

Save**Question 8** (2.25 points)

As a capacitor sensor is actuated, finger is in contact with the sensor, the frequency that the sensor measures

decreases



(single word answer) compared to when the sensor is not actuated.

Save

Question 9 (2.25 points)



Match the best choice of a non-volatile memory to the application

2 ▼

Picture storage for digital camera

1. FRAM

3 ▼

Silicon Labs' Blue GECKO micro controller + BLE

2. NOR

3 ▼

Program memory for a DSP processor

3. NAND

2 ▼

Small non-volatile byte write-able external memory

4. EEPROM

Save

Question 10 (2.25 points)



Nonrepudiation is the inability to deny the following. (select all that apply)

☐ Confidentiality

☐ Privacy

☒ Authenticity

☒ Integrity

Save

Question 11 (2.25 points)



NFC provides a higher level of privacy compared to other RF and wireless networks and protocols through what of the following? (select all that apply)

☐ Mesh network architecture

☒ Limited range of operation (<0.1m)

☐ Star network architecture

☒ Requires intent of use to read the NFC memory

Save

**Question 12** (2.25 points)

Match the property with the NAND Flash technology.

1 ▼ Relatively simple error correction algorithm

2 ▼ Most common FLASH

1 ▼ More expensive per bit

2 ▼ Lower endurance

1 ▼ Faster reads and writes

1. Single Level Cell

2. Multi Level Cell

Save

**Question 13** (2.25 points)

To validate your design and the embedded firmware, you look at the Energy Profiler to obtain the instantaneous current at a portion of the trace. You know the following:

LED0 = off

LED1 = on

Instantaneous current = 1.45mA

HFCLK = HFRC0 @ 14MHz

Which Energy state is the board in at this time?

☐ EM3

☒ EM1

☐ EM2

☐ EM0

Save

**Question 14** (2.25 points)

To validate your design and the embedded firmware, you look at the Energy Profiler to obtain the instantaneous current at a portion of the trace. You know the following:

LED0 = off

LED1 = off

Instantaneous current = 850nA

HFCLK = HFRC0 @ 14MHz

Which Energy state is the board in at this time?

☐ EM2☐ EM0☒ EM3☐ EM1

Save

Question 15 (2.25 points)

My read DMA for my I2C sensor does not appear to be working. I have traced the failure to the below DMA set up routine.

```
1. void I2C0_DMA_Setup(void){
2.     DMA_CfgDescr_TypeDef I2C0_DMA_cfg;
3.     DMA_CfgChannel_TypeDef I2C0_DMA_channel;
4.     I2C0_cb.cbFunc = I2C0_DMA_Done;
5.     I2C0_cb.userPtr = NULL;
6.     I2C0_cb.primary = true;
7.     I2C0_DMA_cfg.arbRate = I2C0_DMA_Arbitration;
8.     I2C0_DMA_cfg.dstInc = dmaDataInc1;
9.     I2C0_DMA_cfg.hprot = 0;
10.    I2C0_DMA_cfg.size = dmaDataSize1;
11.    I2C0_DMA_cfg.srcInc = dmaDataIncNone;
12.    DMA_CfgDescr(I2C0_DMA_Channel, true, &I2C0_DMA_cfg);
13.    I2C0_DMA_channel.cb = &ADC0_cb;
14.    I2C0_DMA_channel.enableInt = true;
15.    I2C0_DMA_channel.highPri = true;
16.    I2C0_DMA_channel.select = DMAREQ_I2C0_SINGLE;
17.    DMA_CfgChannel(I2C0_DMA_Channel, &I2C0_DMA_channel);
18.    DMA->IFC = 1 << I2C0_DMA_Channel;
19.    DMA->IEN |= 1 << I2C0_DMA_Channel;
20. }
```

Which instruction, line item number, is incorrect?

13



Correct the DMA setup routine by providing the correct c-code instruction.

I2C0_DMA_channel.cb &= ADC0_cb;



Save

Question 16 (2.25 points)



Which Bluetooth Smart message requires a response?

- ☒ Indication
- ☒ Read request
- ☒ Write request
- ☐ Notification
- ☐ Write command

Save

Question 17 (2.25 points)



The overriding disadvantage of FRAM is  due to the  memory cell compared to other non-volatile memory technologies.

Save

Question 18 (2.25 points)




Select all the components required for an Energy Harvesting system

- ☐ Flux Capacitor
- ☒ Energy Storage Element
- ☒ Power Management Unit
- ☐ Thermal Generator

Save

Question 19 (2.25 points)



 memories integrate the ECC function with the NAND memory so that the system receives known good data out of the NAND and the controller does not have to perform the ECC function.

Save

Question 20 (2.25 points)



To validate your design and the embedded firmware, you look at the Energy Profiler to obtain the instantaneous current at a portion of the trace. You know the following:

LED0 = off

LED1 = off

HFCLK = HFRC0 @ 14MHz

Instantaneous current = 1.4uA

Which Energy state is the board in at this time?

- ☒ EM3
- ☐ EM2
- ☐ EM0
- ☐ EM1

Save

Question 21 (2.25 points)



To simplify the complexity of a Bluetooth Smart server, multiple requests can be batched for processing.

- ☐ True
- ☒ False

Save

Question 22 (2.25 points)



To reset the data retention "clock" of a FLASH memory, what can the user program perform on the FLASH memory?

Rewrite the data cell.



Save

Question 23 (2.25 points)



Select all possible Energy Harvesting sources

- ☒ Heat from a hot water pipe
- ☐ Near Field Communications
- ☒ Walking
- ☒ Vibration of an engine
- ☐ Ethernet cable

Save

Question 24 (2.25 points)



If a NAND memory that has a maximum number of 15,000 erase cycles per page and has a total of 20 pages configured as follows:

4 program pages

4 data pages

12 empty pages

What is the maximum number of erase cycles could this NAND memory typically experience if there is no wear leveling?

**Question 25** (2.25 points)

In a public key encryption, the (single word answer) key is used for encryption..

**Question 26** (2.25 points)

What is the C instruction to enable the COMP1 interrupt, COMP1, of the RTC through the IEN register of the Leopard Gecko?

**Question 27** (2.25 points)

In Bluetooth Low Energy, a characteristic declaration begins a characteristic. Match the exposed information to its attribute value.

Handle	Type	Value
0x0100	Characteristic	Write, 0x0150, Appearance

0x0150

1. Properties

Appearance

2. Value Handle

Write

3. Characteristic UUID

Question 28 (2.25 points)

In the Course Project, to end an I2C read or write operation, which bit in the I2C IF register must be set before an UnblockSleepMode(EM1) can be executed?

**Question 29** (2.25 points)

A trusted (single word answer) counter is a tamper-resistant counter embedded in a device whose value, once incremented, cannot be reverted back to a previous value.



**Question 30** (2.25 points)

Which Bluetooth Smart messages are not considered reliable?

- ☐ Indication
- ☒ Write command
- ☐ Write request
- ☒ Notification
- ☐ Read request

Save

**Question 31** (2.25 points)

In regards to NAND FLASH memories, match the term with its definition.

2 ▼

To increase the endurance of the FLASH memory, writes are written to a free page with the least number of write/erase cycles

3 ▼

Writes to FLASH memory are written back to the same page that the variable resides or read from.

1 ▼

Static program memory blocks are moved to free pages that have high write/erase cycles to provide additional free pages of memory that have low write/erase cycles available for the system to write to free pages of FLASH memory.

1. Static Wear Leveling

2. Dynamic Wear Leveling

3. No Wear Leveling

Save

**Question 32** (2.25 points)

My application is not working correctly, and I have isolated it to the GPIO setup routine.

```
1. void GPIO_Setup(void){
2.   GPIO_PinModeSet(LED0_port, LED0_pin, gpioModePushPull, 0);
3.   GPIO_PinModeSet(LED1_port, LED1_pin, gpioModePushPull, 0);
4.   GPIO_PinModeSet(LEUART0_TX_port, LEUART0_TX_pin, gpioModePushPull, 1);
5.   GPIO_PinModeSet(LEUART0_RX_port, LEUART0_RX_pin, gpioModePushPull, 1);
6.   GPIO_PinModeSet(Light_Excite_port, Light_Excite_pin, gpioModePushPull,1);    /* Disable ambient by default setting to 0 */
7.   GPIO_PinModeSet(Light_Sensor_port, Light_Sensor_pin, gpioModeDisabled, 0); /* Input pin */
8.   GPIO_PinModeSet(CAPSENSE_Port, CAPSENSE_Pin, gpioModeDisabled,0);
9.   GPIO_PinModeSet(GPIO_Int_Port, GPIO_Int_Pin, gpioModeInput, 0);
10.  GPIO_IntConfig(GPIO_Int_Port, GPIO_Int_Pin, GPIO_Int_Rising, GPIO_Int_Falling, true);
11.  GPIO->INSENSE = GPIO_INSENSE_INT;    // Enable sensing interrupts on GPIO pins
12.  GPIO->IFC = 1 << GPIO_Int_Pin;
13.  GPIO->IEN |= 1 << GPIO_Int_Pin;
14.  NVIC_ClearPendingIRQ(GPIO_ODD_IRQn);
15.  NVIC_EnableIRQ(GPIO_ODD_IRQn);
16. }
```

Which instruction, line item number, is incorrect?



Correct the GPIO setup routine by providing the correct c-code instruction.



Question 33 (2.25 points)



In Bluetooth Smart, a server can response to a client's request with the following. (Select all that apply)

- ☒ Request additional information
- ☐ Response will be available in X minutes
- ☒ Response directly associated with the request
- ☒ An error message

Question 34 (2.25 points)



Select all the security best practices that would have prevented the Foscam camera security hack.

- ☒ Firmware patches should be done automatically without the owner's intervention
- ☒ User's must update the default password upon installing the equipment
- ☒ User's must update the default user name to something other than an email address
- ☐ Debug ports should not be exposed or enabled once the product is released into production

Save

Question 35 (2.25 points)



With multiple sensors being used on the Leopard Gecko, there could be a requirement of more than one sensor needing to send data to the ATSAM11. To insure that the second sensor properly shares the LEUART without corrupting the data of the first transfer, it is recommend to implement a

Save

Question 36 (2.25 points)



Each PROGRAM/ERASE operation can degrade a FLASH memory cell, and over time, the accumulation of cycles can prevent the device from meeting power, programming, or erase specifications or from reading the correct data pattern. The device's data sheet that specifies when this failure can begin to exhibit in failed data is called

. (Two word answer)

Save

Question 37 (2.25 points)



Select all the possible security attacks which are not invasive or active attacks

- ☒ Replay
- ☒ Spoofing
- ☒ Substitution
- ☐ Probing

Save

Question 38 (2.25 points)




In most system, the type of

will be determined by the micro processor, DSP, or FPGA memory controller, thus this memory should be included in the decision of the micro processor, DSP, or FPGA.

Save

Question 39 (2.25 points)

Research proves that if a  (one word answered) procedure is required to update a device's firmware, it is pretty much guaranteed that most people are unlikely to perform the firmware update.

Question 40 (2.25 points)

The application code must insure that the LEUART0 peripheral is finished before re-entering EM3. Complete the following C-code instruction to hold off from exiting the LEUART0 interrupt service routine and going back to sleep in EM3 prematurely.

While ((LEUART0->IF &

) == 0);

Question 41 (2.25 points)

In Bluetooth Smart, match the following terms with their definition.

- | | | |
|------------------------------------|---|--------------------|
| <input type="button" value="1 ▼"/> | Prove that the device is who or what it is | 1. Authentication |
| <input type="button" value="3 ▼"/> | Internal consistency and lack of data corruption | 2. Authorization |
| <input type="button" value="5 ▼"/> | The ability to prevent others from recognizing you from your device | 3. Integrity |
| <input type="button" value="4 ▼"/> | The intent to keep something secret | 4. Confidentiality |
| <input type="button" value="2 ▼"/> | Assign permission to something | 5. Privacy |