P442/542 Midterm 96 **2/25/13**

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Multiple Choice and Matching (3 pts each): Please read each question carefully and select the best answer. Write your answer in the blank provided.

1) C The STM32 has 2 wait state flash memory and 0 wait state SRAM. Which is a true statement about the memory?
   a) There is no difference in the speed of the memory.
   b) The Flash memory delivers information faster than the SRAM.
   c) The SRAM delivers information faster than the flash memory.
   d) It is not possible to determine which memory is faster.

2) b Why is it necessary to call the following function when setting up a GPIO port?

   RCC_AHBPeriphClockCmd(RCC_AHBPeriph_GPIOx,ENABLE);

   a) The function turns on specific bits in the GPIO port.
   b) The function enables the clock to the GPIO port which is disabled by default to save power.
   c) The function configures the GPIO port as an output.
   d) The function causes power to be applied to the peripheral.

Please select the electrical component which best matches the description.

3) b Stores energy in an electric field
4) a Stores energy in a magnetic field
5) e Allows current to flow in only one direction
6) c Used as a switch or amplifier
7) d Impedes flow of current

a) Inductor
b) Capacitor
c) Transistor
d) Resistor
e) Diode

8) a The term half duplex refers to the following property of a communication link:
   a) device on the link must transmit and receive at separate times.
   b) device on the link can transmit and receive at the same time
   c) link uses more pins than a full duplex link.
   d) link transmits data twice as fast as a full duplex link.

9) a What communication link is used in the lab for console I/O (printf, etc):
   a) UART
   b) SPI
   c) I2C
   d) None of the above.

10) C A UART configured at 100 baud would take 10 mS to transmit each bit?
   a) 1
   b) 100
   c) 10
   d) none of the above

$\frac{1}{100} = 0{,}01 = 10\ mS$

11) d What is the purpose of the following code fragment?

```
while (USART_GetFlagStatus(USART1,USART_FLAG_TXE)==(uint16_t)RESET);
USART_SendData(USART1,c);
```

   a) enables transmitter interrupt
   b) waits for interrupt handler to run.
   c) sets transmitter empty flag
   d) polls transmitter status flag to confirm it is empty before loading a character

12) d What is an advantage of interrupt driven I/O over polling I/O.
   a) consumes less CPU resource
   b) allows prioritization of I/O
   c) continual checking of status flag allows faster response time
   d) both A and B

13) b In Serial Peripheral Interface (SPI) communication, it is necessary for the master to send data to receive data because:
   a) SPI is half-duplex
   b) the master and slave shift registers act as linked shift registers
   c) the master has to first transmit the address of the slave
   d) SPI uses 2 wires to communicate

14) C In SPI communication, the master uses the following mechanism to direct communication to a particular peripheral device.
   a) master sends address across the data lines
   b) master pull interrupt line on peripheral low
   c) master asserts the chip select for the particular peripheral
   d) slave initiates communication with master

15) b One advantage of I2C over SPI is:
   a) I2C uses a fixed number of pins regardless of the number of peripherals connected making it more extensible.
   b) I2C is typically faster than SPI
   c) I2C uses chip select bits to control peripherals
   d) I2C is full-duplex

16) b In the "Absolute Maximum Ratings" section of a typical component data sheet, the values listed in the "Supply Voltage" row of the table indicate:
   a) which type of power supply can be used with the component.
   b) the highest and lowest voltages that can be applied to the component before damage occurs
   c) the typical voltages while the component is off
   d) suggested voltages for normal operation of the component.

17) d During the architecture design aspect of the design process, which are categories of influence that should be considered?
   a) business
   b) political
   c) technical
   d) all of the above

18) C The duty cycle of a PWM waveform that has a 7mS high time and a 10mS period is:
   a) 40%
   b) 30%
   c) 70%
   d) 10%

19) c The following scheduler code is called based on a flag controlled by a 100Hz systick clock interrupt. How would the code need to change if the systick interrupt were 500Hz?

```
void scheduler(void) {
  static int counter_100mS = 0;
  if (counter_100mS++==COUNTER_LIMIT_100mS) {
    counter_100mS=0;
    // tasks to accomplish at 100mS intervals
  }
}
```

a) COUNTER_LIMIT_100mS would need to have 5 added
b) COUNTER_LIMIT_100mS would need to be multiplied by 5
c) COUNTER_LIMIT_100mS would need to be divided by 5.
d) COUNTER_LIMIT_100mS would need to have 5 subtracted

20) a In a FAT file system, how does the system know when all of the clusters of a file have been read?

a) a 0xFFFF is read from the file allocation table
b) an interrupt is generated by the SD card
c) a set number of clusters have been read from the disk because all files are required to be the same size
d) the entire last cluster of the file is full of 0's.

21) b low cost and low accuracy
22) a low noise and low efficiency
23) c high efficiency and high cost

a) linear regulator
b) zener regulator
c) switch-mode converter

24) d The STM32 has separate oscillator and power pins for the real-time clock because:

a) pins on the processor are readily available
b) the real-time clock only runs when the processor is powered off
c) the real-time clock uses significantly more power than the processor
d) this allows the real-time clock to operate independently of the state of the processor including when the processor is powered off

25) b Ohm's Law relates resistance (R), current (I), and voltage (V) with the equation:

a) R = V * I
b) I = V * R
c) V = I * R
d) none of the above

Short Answer (5 pts each): Please provide a brief (1-3 sentence) answer to the following questions.

26) Why is it important to have measurable deliverables in the objectives section of the design profile?

To know when the project is done.

27) You are working on lab 7 and have just compiled and downloaded software to the STM32. The SPI link that you were trying to get working is providing odd data. Briefly describe two approaches that might provide useful information in debugging the communication link?

Saelo logic, to check the power of the link.
Debugging the initialization code, usually printing flags and/or using gdb.

28) Why was it necessary to create putchar and getchar functions when integrating the newlib stubs?

To develop specific functions to communicate with our system, In this case with the UART interface. If we were using another interface, we would have to develop getchar and putchar for such interface. Very Good!

29) In the I2C protocol, what must be transmitted to select the desired peripheral component?

the peripheral address.

30) What is the mechanism that causes the SysTick_Handler to run?

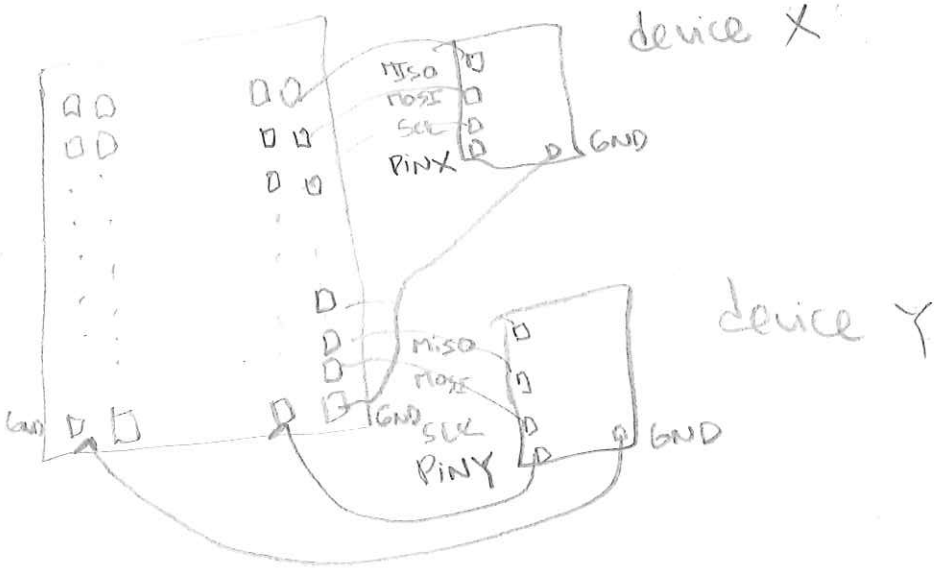
Interrupts driven by the system's clock.

Bonus Question (10 pts)

31) If the system you were designing 2 devices connected to a specific SPI peripheral on the STM32. What SPI pins would route to both devices? What pins would be unique between the two devices? Make a sketch of the connections.

MISO
MOSI
SCK
} would route to both devices

the pins that are unique between the devices are usually unique labelled, such as SD for the SD CARD.



+5 - common pins are spot on. However the unique pins should also include chip selects for each device.