Chris Thomas

EET 241

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**Section 1: ADC Characteristics**

1. True or false. The output of most sensors is analog?
   1. True
2. True or false. ADC0848 is an 8-bit ADC.
   1. True
3. True or false. An ADC with 8 channels of analog input must have 8 pins, one for each analog input.
   1. False
4. True or false. ADC0848 has 4 channels of analog input
   1. False
5. True or false. ADC0848 is a serial ADC
   1. False
6. Which of the following ADC sizes provides the best resolution?
   1. 8-bit
   2. 10-bit
   3. 12-bit
   4. 16-bit
   5. They are all the same
7. Calculate the step size for the following ADCs, if Vref is 5V.
   1. 8-bit
      1. 5/256 = 19.53mV
   2. 10-bit
      1. 5/1024 = 4.88mV
   3. 12-bit
      1. 5/4096 = 1.2mV
   4. 16-bit
      1. 5/65,536 = 0.076mV
8. In the ADC0848, what should the Vref value be if we want a step size of 5mV?
   1. 1.28/256 = 5mV

**Section 2: ADC Programming in the AVR**

1. True or false. The Atmega32 has an on-chip A/D converter.
   1. True
2. True or false. ATmega32 has 8 channels of analog input.
   1. True
3. True or false. The A/D conversion speed in the ATmega32 is turned on and ready to go.
   1. False
4. True or false. The A/D module of the ATmega32 has an external pin for the start-conversion signal.
   1. False
5. True or false. The A/D module of the ATmega32 can have multiple external Vref+ at any given time
   1. False
6. In the A/D of ATmega32, what happens to the converted analog data? How do we know that the ADC is ready to provide us the data?
7. For the A/D of Atmega32, find the step size for each of the following Vref:
   1. 1.024V
      1. 1.024V/1024 = 1mV
   2. 2.048V
      1. 2.048V/1024 = 2mV
   3. 2.56V
      1. 2.56V/1024 = 2.5mV
8. In the ATmega32, what should the Vref value be if we want a step size of 3mv?
   1. 3mV \* 1024 = 3.072V
9. With Vref = 1.024V, find the Vin for the following outputs:
   1. 0011111111
   2. 0010011000
   3. 0011010000
10. With Vref = 2.56V, find the Vin for the following outputs:
    1. 1111111111
    2. 1000000001
    3. 1100110000
11. Find the first conversion times for the following cases if XTAL = 4MHz. Are they acceptable?
    1. Fosc/8
    2. Fosc/16
    3. Fosc/32
    4. Fosc/64
12. How do we recognize the end of conversion in the ATmega32?
13. Which bits of which register of the ATmega32 are used to select the analog channel to be converted?
14. Upon power-on reset, the A/D of the ATmega32 is given (on, off)

**Section 3: Sensor Interfacing and Signal Conditioning**

1. The LM34 sensor produces \_\_\_\_\_\_ mV for each degree of temperature.

**Section 4: DAC Interfacing**

1. True or false. DAC0808 is the same as DAC1408.
2. For DAC1408, if Iref = 2mA, show how to get the Iout of 1.99 when all inputs are HIGH.
3. To get a smaller step, we need a DAC with \_\_\_\_\_\_\_\_ (more, fewer) digital inputs.