EE322: Embedded Systems Design Pre-lab preparation for Lab III

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E/16/103

GROUP 10

SEMESTER 5

1. Identify the important parameters and registers of the microcontroller which are used to control the A/D converter module.

a) Learn about the following registers and explain their functions

A/D Result High Register (ADRESH)

The analog value converted in to digital has a 10 bit representation. A normal register can carry only 8 bits. To store the value we use two registers. ADRESH and ADRESL. Depending on which format we use to store the value specifically left justified or right justified, The bits of these two registers will get updated .

Right justified. 6 Most Significant bits of ADRESH are read as ‘0’.

Left justified. 6 Least Significant bits of ADRESL are read as ‘0’.

If right justified is used 0,1&2nd bits are used to store data in ADRESH register and rest of the bits will be 0.

If left justified is used all the bits are used to store data in ADRESH register.

A/D Result Low Register (ADRESL)

If left justified is used 5,6&7th bits are used to store data in ADRESH register and rest of the bits will be 0.

If right justified is used all the bits are used to store data in ADRESH register.

A/D Control Register 0 (ADCON0)

This register is used to control ADC conversion. The parameters we can control here are

1.we can select a clock to the conversion process

2.Selecting a channel to ADC conversion

3.control conversion status

A/D Control Register 1 (ADCON1)

This register is used for the controlling purposes. From this register we can change ADC result format bit which gives us the option to change the result to left justified or right justified.

Before conversion process begin we should configure the port.4 bits are dedicated to configuration which means we can configure ports in 2^4 different ways.

b) Calculate the conversion time on following occasions

i. If a 4MHz system clock is used to drive the microcontroller and Fosc/32 is used to drive the ADC module

For the A/D converter to meet its specified accuracy, the charge holding capacitor (CHOLD) must be allowed to fully charge to the input channel voltage level.

The time taken for that is known as acquisition time (19.72μs)

The A/D conversion time per bit is defined as TAD. The A/D conversion requires a minimum 12TAD per 10-bit conversion.(TAD = 32\*.25 μs=8 μs)

Total conversion time = 12TAD + TACQ

= 12\*8+19.72

= 115.72μs

ii. If the internal RC oscillator is used to drive the ADC module.

TAD = 4 μs

Total conversion time = 12TAD + TACQ

= 12\*4+19.72

= 67.72μs

c) If Vref+ is 2.56 V and Vref- is 0 V, Calculate the voltage corresponding to one step of the converted value.

Range = 2.56-0

= 2.56V

Number of steps = 2^10

= 1024

Smallest value to be represented = 2.56/1024

= 0.0025 V

2. What is the effect of resetting of the microcontroller to ADC module? What happens to the configured registers of the ADC module?

It will erase ADC data.