Practical No: 05

Part A

Title: Design a simple oscilloscope.

Introduction:

This practical is aimed to study built in ADC of the ATmega328P microcontroller and user created exeternal flash ADC.

Task 01: Study built in ADC of the ATmega328P microcontroller (using analogRead()).

1. Write a C/C++ code to the microcontroller to configure the built-in ADC and read the analog signal generated by a function generator, which is connected to the one of analog input pins of the microcontroller. (Note: use Arduino analogRead() function)
2. Use a delay in the loop in order to control the sampling rate (reading rate).
3. Assign the captured analog value to 10 digital pins.
4. Connect a 10 bit R-2R ladder DAC to the above 10 pins of the microcontroller.
5. Connect an oscilloscope to DAC to observe the signal.
6. Set the function generator to produce 4V peak to peak 10 kHz sine signal.
7. Starting from 200 ms reduce the loop delay to read analog input faster and measuer the frequency of the signal at the oscilloscope connected to the DAC.
8. Complete the Table 1.

Delay (ms)	Frequency of the signal (DAC output)	Comments (any distorts)
200		
150		
100		
50		
25		
0		

9. Repeat the steps from 6 to 8 for input frequency 1 kHz, 500 kHz and 100 Hz.
10. Discuss the reasons for any distortions you observed.

Task 02: Study built in ADC of the ATmega328P microcontroller (using internal interrupt).

1. Write a C/C++ code to the microcontroller to configure the built-in ADC run in interrupt mode. (Note: Do not use Arduino built in software functions)
2. Repeat the Task 01 with ADC in interrupt mode. (note: delay function in the step 2 is not necessary now)

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