# Module 15

## Activity: Data Acquisition Systems

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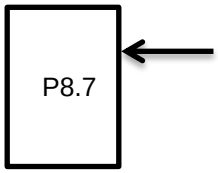
## Question 1

Write C code that samples ADC channel 18, P8.7. In particular implement these two functions. Use 14-bit mode, busy-wait, 3.3V reference.

**void ADC0_InitSWTriggerCh18(void);**
**// initialize P8.7, channel A18**

**uint32_t ADC_In18(void);**
**// sample P8.7, channel A18**

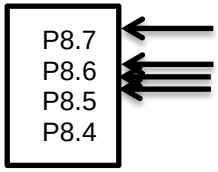



## Question 2

Write C code that samples ADC channels 18-21, P8.7 to P8.4. In particular implement these two functions. Use 14-bit mode, busy-wait, 3.3V reference. Use call by reference to return four ADC samples.

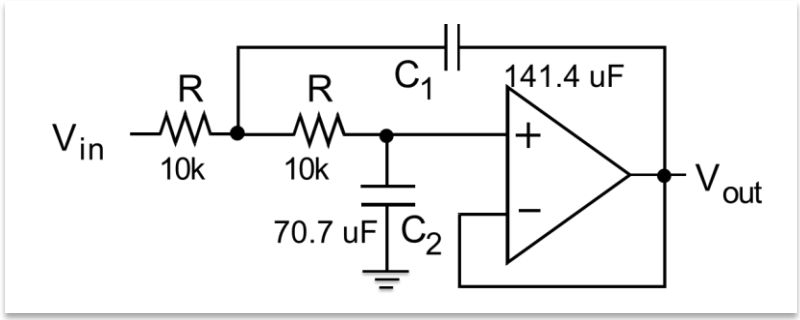
**void ADC0_InitSWTriggerCh18_19_20_21(void);**
**// initialize P8.7, P8.6, P8.5, P8.4, channels A18-A21**

**uint32_t ADC_In18_19_20_21 (**
**uint32_t *ch18,**
**uint32_t *ch19,**
**uint32_t *ch20,**
**uint32_t *ch21);**
**// sample P8.7, P8.6, P8.5, P8.4, channels A18-A21**




## Question 3

Using this design template, build a 1000 Hz, two-pole Butterworth low pass filter




## Question 4

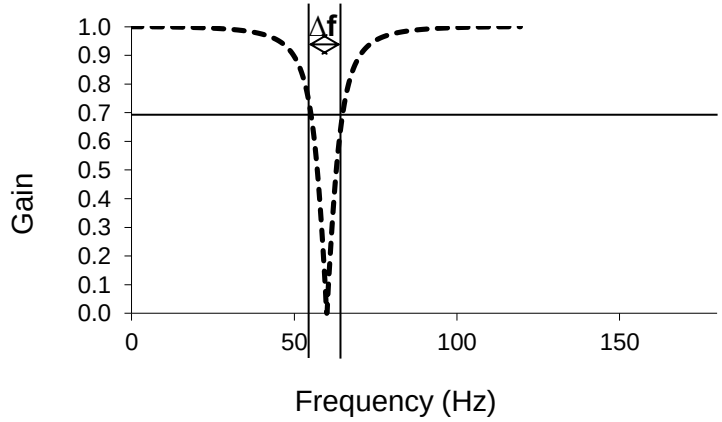
Write C code for the periodic ISR to implement this digital filter.

y(n) = (113•x(n) + 113•x(n-2) - 98•y(n-2))/12

where

x(n) is the current sample, e.g., **x[0] = ADC_In12();**
x(n-1) is the previous sample, **x[1]**
x(n-2) is the sample two times ago, **x[2]**
y(n) is the current filter output, **y[0]**
y(n-2) is the filter output two times ago, **y[2]**

If the data are sampled at fs=240 Hz, this filter is a high-Q (Q=6) 60 Hz reject filter.



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