Homework 7

1. Use logical and/or arithmetic rotation/shift instructions to divide the 32-bit signed number saved in R19, R18, R17, R16 (high byte first) by 2^7.  We assume that R19 contains the most significant byte and R16 contains the least significant byte.  Save the result in the same registers.

LDI R20, 0

L1:

ASR R19

ROR R18

ROR R19

ROR R17

ROR R16

INC R20

CPI R20, 7

BRNE L1

RET

2. Find the contents of R20 after each of the following is executed:

**LDI R20, 0x8A ;** R20 = 0b1000 1010 C = ?

**CLC ;** R20 = 0b1000 1010 C = 0

**ROR R20 ;** R20 = 0b0001 0100 C = 1

**ASR R20 ;** R20 = 0b0000 1010 C = 0

3. Write a program to test if the pattern “1010” exists in an 8-bit input binary number. Please use shift instructions.

4. Calculate the step sizes of ADC using the following number of bits with Vref=32V.

* 2-bit: 32V/ = 8 V
* 8-bit: 32V/ = 0.125 V
* 16-bit: 32V/ = 0.0004883 V

5. With Vref=25.6V and 10 bit ADC, find Vin for the following outputs:

* Dout = 215 5.375 V
* Dout =84 2.1 V
* Dout = 233 5.825 V

6. For the 10-bit ADC in ATmega328p, find the step size for each of the following Vref:

* 25 mV 0.0244 mV
* 4096 mV 4 mV
* 50 V 0.4883 V