Code

.INCLUDE "m32DEF.INC" ;Header file for directives

.ORG 0X00 ;Beginning of the address

.ORG 0X000A

JMP PCINT\_2INTERRUPT ;calling ISR

LDI R22, 255 ;This is a flag used to decide whether input to be taken in R16 or R17

in ISR

;Setting the Microcontroller to call ISR when Pin PCINT23 of it toggles.

SBI PCICR, PCIE2

SBI PCIFR, PCIF2

SBI PCMSK2, PCINT23

;Port D: Input Conversion flag. Port B: Input ADC input (8+8 bits in 2 cycles). Port C: output to DAC

LDI R16, 0

OUT DDRD, R16

OUT DDRB, R16

LDI R16, 255

OUT DDRC, R16

SEI ;Set I=1 in SREG

;main function

LOOP:

BREQ DAC ;When R20=0 (After ISR is called 2nd time), perform operations to store DAC input in R19 (MSB 8 bits of the 16-bit ADC output)

OUT PORTC, R19 ;Send output to DAC

RJMP LOOP ;Loop

DAC:

;removing LSB 4 bits as they are not considered in output

ANDI R16, 0b11110000

ANDI R17, 0b11110000

LDI R18, 0b10000000 ;used to mask R19

LDI R21, 0 ;Flag to perform operation on R17 or R16

AGAIN:

BRNE LSB

LSL R17 ;Left Shift

RJMP HERE

LSB:

LSL R16 ;Left Shift

HERE:

BRCS Operation ;if carry is 1, set the corresponding set bit of R18 in R19

BACK:

MOV R24, R16 ;if R16==0, stop DAC subroutine and return to Loop

BRNE REPEAT

RJMP LOOP

REPEAT:

COM R21

RJMP AGAIN

Operation:

SBR R19, R18 ;set the corresponding set bit of R18 in R19

LSR R18 ;right shift R18

RJMP BACK

PCINT2\_INTERRUPT:

RCALL FLAG ;Flag to select which register (R16 or R17) to take input in

BRNE Second

IN R16, PINC ;Input D14 D12, .... , D0 in R16

RJMP EXIT

Second:

IN R17, PINC ;Input D15 D13, .... , D1 in R16

LDI R20, 0 ;Flag to signal R16 and R17 are loaded with ADC output and DAC subroutine can be called

EXIT:

RETI

FLAG:

COM R22 ;Flag which toggles R22 to help select which register (R16 or R17) to take input in

RET

Q.2 What is SNR (Signal to Noise) ratio? Explain how SNR will vary in case of an ADC when 1 bit of ADC is increased/decreased.

**Signal-to-noise ratio** (**SNR** or **S/N**) is defined as the ratio of signal power to the [noise power](https://en.wikipedia.org/wiki/Noise_power), often expressed in [decibels](https://en.wikipedia.org/wiki/Decibel). A ratio higher than 1:1 (greater than 0 dB) indicates more signal than noise.

When the bit of ADC is increased SNR ratio increases.

When the bit of ADC is decreased SNR ratio decreases.