Cng 336

Lab 4 Prework

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4.2

2.

```
USART: ;initialize registers
              ldi r16,0x00; all bits are 0
              out UCSR0A,r16;
              ldi r16,0x18 ; just rxen and txen is 1
              out UCSR0B,r16;
              ldi r16,0x86 ; rw , ucszn1 and ucszn0 is 1
              sts UCSR0C,r16
              ldi r16,0x00; ; all bit are 0
              sts UBRR0H,r16
              ldi r16,0x33; baudrate is 51
              out UBRR0L,r16;
ret
```

3.

```
SENDCHAR:
Loop_1:       sbis UCSR0A, UDRE0 ; wait until udre0 set
              rjmp Loop_1
              out UDR0, R16  ; if set send the value to terminal
ret
```

4.

```
SENDSTR:
              ldi XL,LOW(0x0200) ; starting adress is 0x200
              ldi XH,HIGH(0x0200) ; same
              ldi r18, '$' ; compare bit
Loop_2:              ld r16, X+ ; store x to r16 and increment x
              cp r16, r18 ; compare
              breq Loop_3 ; if $ is not entered continue
        call SENDCHAR ; if entered send char to terminal
              jmp Loop_2 ; jump until $ entered
Loop_3:              ret ; return
```

5.

```
RECVCHAR: ; beginning of receive char subroite
Loop_4:       sbis UCSR0A,RXC0 ; wait until rxc0 set
              rjmp Loop_4 ;jump
              in r17, UDR0 ; put the char in terminal to r17
ret
```

6.

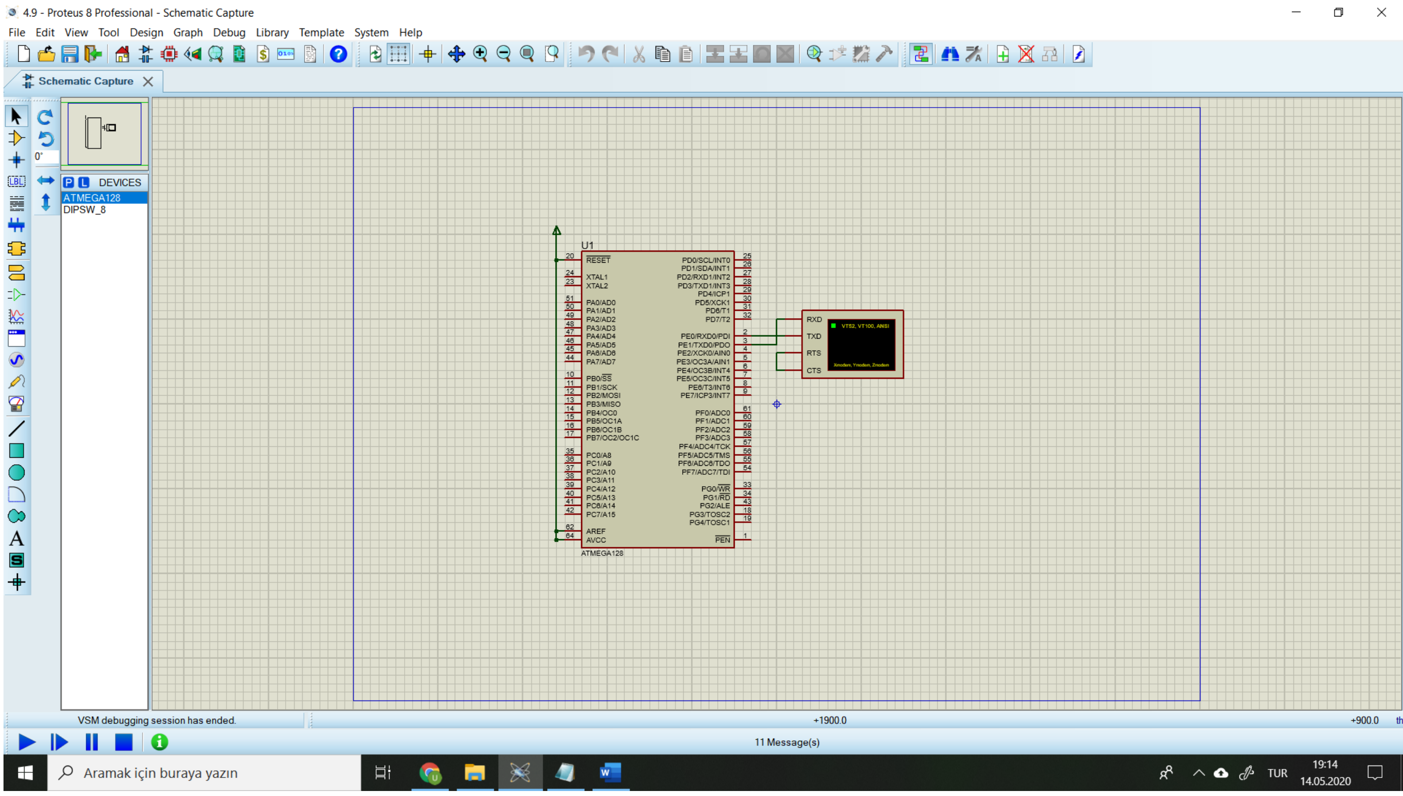
```
RECVSTR:; beginning of receive str function
              ldi YL,LOW(0x0400) ; starting adress is 0x400
              ldi YH,HIGH(0x0400) ; same
              ldi r18,'$' ; compare character
Loop_5:       call RECVCHAR ; receive char from terminal
              cp r17,r18 ; check if last bit $
              breq Loop_6 ; if yes, end
              st Y+, r17 ; else store r17 into y pointer then inc y+
              jmp Loop_5 ; continue
Loop_6:       ldi r20,'\n' ; this is for next line
              st Y+,r20 ; store next line
              ldi r20,'\r' ; this is also for next line
              st Y+,r20 ; same
              st Y+,r18 ;add $ too
ret ;return
```

7.

```
welcome: ; beginning of welcome subroutine
              ldi ZL, LOW(MSG1<<1) ; put MSG1 's adress to Z pointer
              ldi ZH, HIGH(MSG1<<1) ; same
              ldi XL,LOW(0x0200) ; put storing adress to x pointer
              ldi XH,HIGH(0x0200) ; same
              ldi r18, '$' ; load compare character
Loop_7:              lpm r19, Z+ ; store the char at Z into r19 then inc Z
              st X+,r19 ; store the char r19 to X then inc X
              cp  r19,r18 ; compare r18 and r19
              breq Loop_8 ; if yes then break
              jmp Loop_7 ; else continue
Loop_8:              call SENDSTR ; call sendstr func
              call RECVSTR ; call recvstr func
              ldi ZL, LOW(MSG2<<1) ; put hello's adress to Z pointer
              ldi ZH, HIGH(MSG2<<1) ; same
              ldi XH, HIGH(0x200) ; put the name's adress into X pointer
              ldi XL, LOW(0x200); same
Loop_9:              lpm r19,Z+ ; Put the char at Z into r19 then inc Z
              st X+,r19 ; put the char at r19 into X then inc X
              cp  r19,r18 ; compare
              breq Loop_10 ;if r19 is $ then break
              jmp Loop_9 ;else continue
Loop_10:      call SENDSTR ; call send str func
              ldi XL,LOW(0x0200) ;name is at 0x200
              ldi XH,HIGH(0x0200);same
              ldi YL,LOW(0x0400);recieved string is at 0x400
              ldi YH,HIGH(0x0400);same

cont:  ld  r20, Y+ ; put the value to r20 then inc Y
              st X+,r20 ; load r20 into x then inc x
              cp  r20, r18 ;compare if r20 is $
              breq Loop_11 ; if yes end
              jmp cont ; else continue
Loop_11:      call SENDSTR        ; send str to terminal
              ret ; end
```

8)


4.9 - Proteus 8 Professional - Schematic Capture
File Edit View Tool Design Graph Debug Library Template System Help
Schematic Capture
DEVICES
ATMEGA128
DIPSW_8
U1
ATMEGA128
RXD
TXD
RTS
CTS
VSM debugging session has ended.
11 Message(s)
Aramak için buraya yazın
TUR
19:14
14.05.2020

9)

```
.include "m128def.inc"


.ORG 0x0000
.MACRO INITSTACK ; initialize stack
LDI R16,HIGH(RAMEND)
OUT SPH,R16
LDI R16,LOW(RAMEND)
OUT SPL,R16
.ENDMACRO
INITSTACK
call USART ; call usart subroutine
END:call welcome ; call welcome subroutine
rjmp END  ; jump and ask again

USART: ;initialize registers
             ldi r16,0x00; all bits are 0
             out UCSR0A,r16;
             ldi r16,0x18 ; just rxen and txen is 1
             out UCSR0B,r16;
             ldi r16,0x86 ; rw , ucszn1 and ucszn0 is 1
             sts UCSR0C,r16
             ldi r16,0x00; ; all bit are 0
             sts UBRR0H,r16
             ldi r16,0x33; baudrate is 51
             out UBRR0L,r16;
ret
```

```
SENDCHAR:
Loop_1:        sbis UCSR0A, UDRE0 ; wait until udre0 set
               rjmp Loop_1
               out UDR0, R16  ; if set send the value to terminal
ret

SENDSTR:
               ldi XL,LOW(0x0200) ; starting adress is 0x200
               ldi XH,HIGH(0x0200) ; same
               ldi r18, '$' ; compare bit
Loop_2:               ld r16, X+ ; store x to r16 and increment x
               cp r16, r18 ; compare
               breq Loop_3 ; if $ is not entered continue
         call SENDCHAR ; if entered send char to terminal
               jmp Loop_2 ; jump until $ entered
Loop_3:               ret ; return

RECVCHAR: ; beginning of receive char subroite
Loop_4:        sbis UCSR0A,RXC0 ; wait until rxc0 set
               rjmp Loop_4 ;jump
               in r17, UDR0 ; put the char in terminal to r17
ret

RECVSTR:; beginning of receive str function
               ldi YL,LOW(0x0400) ; starting adress is 0x400
               ldi YH,HIGH(0x0400) ; same
               ldi r18,'$' ; compare character
Loop_5:        call RECVCHAR ; receive char from terminal
               cp r17,r18 ; check if last bit $
               breq Loop_6 ; if yes, end
               st Y+, r17 ; else store r17 into y pointer then inc y+
               jmp Loop_5 ; continue
Loop_6:        ldi r20,'\n' ; this is for next line
               st Y+,r20 ; store next line
               ldi r20,'\r' ; this is also for next line
               st Y+,r20 ; same
               st Y+,r18 ;add $ too
ret ;return

welcome: ; beginning of welcome subroutine
               ldi ZL, LOW(MSG1<<1) ; put MSG1 's adress to Z pointer
               ldi ZH, HIGH(MSG1<<1) ; same
               ldi XL,LOW(0x0200) ; put storing adress to x pointer
               ldi XH,HIGH(0x0200) ; same
               ldi r18, '$' ; load compare character
Loop_7:               lpm r19, Z+ ; store the char at Z into r19 then inc Z
               st X+,r19 ; store the char r19 to X then inc X
               cp  r19,r18 ; compare r18 and r19
               breq Loop_8 ; if yes then break
               jmp Loop_7 ; else continue
Loop_8:               call SENDSTR ; call sendstr func
               call RECVSTR ; call recvstr func
               ldi ZL, LOW(MSG2<<1) ; put hello's adress to Z pointer
               ldi ZH, HIGH(MSG2<<1) ; same
               ldi XH, HIGH(0x200) ; put the name's adress into X pointer
               ldi XL, LOW(0x200); same
Loop_9:               lpm r19,Z+ ; Put the char at Z into r19 then inc Z
               st X+,r19 ; put the char at r19 into X then inc X
               cp  r19,r18 ; compare
               breq Loop_10 ;if r19 is $ then break
               jmp Loop_9 ;else continue
Loop_10:       call SENDSTR ; call send str func
```

```
              ldi XL,LOW(0x0200) ;name is at 0x200
              ldi XH,HIGH(0x0200);same
              ldi YL,LOW(0x0400);recieved string is at 0x400
              ldi YH,HIGH(0x0400);same

cont:  ld  r20, Y+ ; put the value to r20 then inc Y
              st X+,r20 ; load r20 into x then inc x
              cp  r20, r18 ;compare if r20 is $
              breq Loop_11 ; if yes end
              jmp cont ; else continue
Loop_11:      call SENDSTR        ; send str to terminal
              ret ; end

.ORG 0x500 ;starting adress
MSG1: .DB "What is your name ?",'\n','\r','$' ; first data
MSG2: .DB "Hello $" ; second data
```

10.

```
INTEN:
SEI
ret
```

11.

```
Timer:
LDI R16,0xFF
out ddra,R16
out ddrb,r16
LDI R20,0x0
OUT TCCR1A,R20 ;timer starts from 0;
OUT TCNT1H,R20      ;timer starts from 0;
OUT TCNT1L,R20 ;timer starts from 0;

LDI R20,0x1E
OUT OCR1AH,R20
LDI R20,0x84;prescaler is clk/1024 1/(8*10^6/(1024))*x=1 s
OUT OCR1AL,R20 ;loaded will cause interrupt to occur when counter reaches 1e84 since
we are using compare match and using a prescaler to slowdown the counter

LDI R20,0x0D
OUT TCCR1B,R20

ldi R21,0
ldi R22,0
LDI R20,(1<<OCIE1A);enable interrupt for compare flag for timre1 A
OUT TIMSK,R20
SEI
ret
```

12.

```
.include "m128def.inc"

.org 0x0000
rjmp main

.org 0x0018
rjmp IsrTim
```

```
main:
ldi r16,high(RAMEND)
out SPH,r16
ldi r16,low(RAMEND)
out SPL,r16
call USART
call INTEN ; enable interrupt
call timer ; call timer
END:call WELCOME


rjmp END




USART:
             ldi r16,0x00;
             out UCSR0A,r16;
             ldi r16,0x18
             out UCSR0B,r16;
             ldi r16,0x86
             sts UCSR0C,r16
             ldi r16,0x00;
             sts UBRR0H,r16
             ldi r16,0x33;
             out UBRR0L,r16;
ret

SENDCHAR:
Loop_1:             sbis UCSR0A, UDRE0
             rjmp Loop_1
             out UDR0, R16
ret

SENDSTR:
             ldi XL,LOW(0x0200)
             ldi XH,HIGH(0x0200)
             ldi r18, '$'
Loop_2:             ld r16, X+
             cp r16, r18
             breq Loop_3
        call SENDCHAR
             jmp Loop_2
Loop_3:             ret

RECVCHAR:
Loop_4:             sbis UCSR0A,RXC0
             rjmp Loop_4
             in r17, UDR0
ret

RECVSTR:
             ldi YL,LOW(0x0400)
             ldi YH,HIGH(0x0400)
             ldi r18,'$'
Loop_5:             call RECVCHAR
```

```
             cp r17,r18
             breq Loop_6
             st Y+, r17
             jmp Loop_5
Loop_6:             ldi r20,'\n'
             st Y+,r20
             ldi r20,'\r'
             st Y+,r20
             st Y+,r18
ret

WELCOME:
             ldi ZL, LOW(MSG1<<1)
             ldi ZH, HIGH(MSG1<<1)
             ldi XL,LOW(0x0200)
             ldi XH,HIGH(0x0200)
             ldi r18, '$'
Loop_7:             lpm r19, Z+
             st X+,r19
             cp  r19,r18
             breq Loop_8
             jmp Loop_7
Loop_8:             call SENDSTR
             call RECVSTR
             ldi ZL, LOW(MSG2<<1)
             ldi ZH, HIGH(MSG2<<1)
             ldi XH, HIGH(0x200)
             ldi XL, LOW(0x200)
Loop_9:             lpm r19,Z+
             st X+,r19
             cp  r19,r18
             breq Loop_10
             jmp Loop_9
Loop_10:     call SENDSTR
             ldi XL,LOW(0x0200)
             ldi XH,HIGH(0x0200)
             ldi YL,LOW(0x0400)
             ldi YH,HIGH(0x0400)

cont:  ld  r20, Y+
             st X+,r20
             cp  r20, r18
             breq Loop_11
             jmp cont
Loop_11:     call SENDSTR
             ret

.ORG 0x500
MSG1: .DB "What is your name ?",'\n','\r','$'
MSG2: .DB "Hello $"

Timer:
LDI R16,0xFF
out ddra,R16
out ddrb,r16
LDI R20,0x0
OUT TCCR1A,R20 ;timer starts from 0;
OUT TCNT1H,R20      ;timer starts from 0;
OUT TCNT1L,R20 ;timer starts from 0;

LDI R20,0x1E
OUT OCR1AH,R20
```

```
LDI R20,0x84;prescaler is clk/1024 1/(8*10^6/(1024))*x=1 s
OUT OCR1AL,R20 ;loaded will cause interrupt to occur when counter reaches 1e84 since
we are using compare match and using a prescaler to slowdown the counter

LDI R20,0x0D
OUT TCCR1B,R20

ldi R21,0
ldi R22,0
LDI R20,(1<<OCIE1A);enable interrupt for compare flag for timre1 A
OUT TIMSK,R20
SEI
ret

IsrTim:;we are holding our values for ports here on r21,r22 and incrementing r21 if
when we increment 21 it becomes 0 that means there is an overflow on register and we
should increment r22 which shows the upper 8 bits
clc
Inc R21
brne still
inc R22
still:
out portA,R21
out portB,R22
reti

INTEN:
SEI
Ret
```

13)

```
IsrRec:;receive char
in  r18, UDR0 ; copy UDR to R17
       st X+,r18
       cpi r18,'$'
       brne keep_going
       ldi r16,0
       out UCSR0B,r16;disable interrupt
keep_going:reti
```

14)

```
welcome:
             ldi ZL, LOW(MSG1<<1)
             ldi ZH, HIGH(MSG1<<1)
             ldi XL,LOW(0x0200)
             ldi XH,HIGH(0x0200)
             ldi r18, '$'
L7:          lpm r19, Z+
             st X+,r19
             cp  r19,r18
             breq L8
             jmp L7
L8:          ldi XL,LOW(0x200)
             ldi XH,HIGH(0x200)
```

```
              ldi R16,(1<<TXEN0)|(1<<UDRIE0);enabling interrupt to write to memory
              out ucsr0b,r16;
              ldi ZL,LOW(MSG2<<1)
              ldi ZH,HIGH(MSG2<<1)
              ldi XL,LOW(0x300)
              ldi XH,HIGH(0x300)
L9:           lpm r19,Z+
              cpi r19,'$'
              breq print
              st X+,r19
              jmp L9
print: ldi R16,(1<<RXEN0)|(1<<RXCIE0);
              ldi XL,LOW(0x300)
              ldi XH,HIGH(0x300)
              ldi R16,(1<<TXEN0)|(1<<UDRIE0);enable interrupt to sent data
ret
```

15)

```
.include "m128def.inc"
RJMP MAIN
.ORG 0x24
RJMP IsrRec
.org 0x26
RJMP IsrTr


MAIN:ldi r16,high(RAMEND)
out SPH,r16
ldi r16,low(RAMEND)
out SPL,r16
LDI R16,(1<<UCSZ01)|(1<<UCSZ00); 8 bit data, no parity, 1 stop bit
sts UCSR0C, R16
LDI R16,0x33 ; 9600 baud rate
OUT UBRR0L, R16 ; XTAL = 8 MHz
LDI R16, 0xFF
OUT DDRB, R16
out DDRA, r16 ; set PORTB as output
SEI ; enable interrupts globally
ldi ZL, LOW(MSG1<<1)
ldi ZH, HIGH(MSG1<<1)
ldi ZL, LOW(MSG1<<1);
ldi ZH, HIGH(MSG1<<1);
ldi YL, LOW(0x200);
ldi YH, HIGH(0x200);
call welcome
WAIT: RJMP WAIT ; stay here until a byte arrives

welcome:
              ldi ZL, LOW(MSG1<<1)
              ldi ZH, HIGH(MSG1<<1)
              ldi XL,LOW(0x0200)
              ldi XH,HIGH(0x0200)
              ldi r18, '$'
L7:           lpm r19, Z+
              st X+,r19
              cp  r19,r18
              breq L8
              jmp L7
L8:           ldi XL,LOW(0x200)
```

```
              ldi XH,HIGH(0x200)
              ldi R16,(1<<TXEN0)|(1<<UDRIE0);enabling interrupt to write to memory
              out ucsr0b,r16;
              ldi ZL,LOW(MSG2<<1)
              ldi ZH,HIGH(MSG2<<1)
              ldi XL,LOW(0x300)
              ldi XH,HIGH(0x300)
L9:           lpm r19,Z+
              cpi r19,'$'
              breq print
              st X+,r19
              jmp L9
print: ldi R16,(1<<RXEN0)|(1<<RXCIE0);
              ldi XL,LOW(0x300)
              ldi XH,HIGH(0x300)
              ldi R16,(1<<TXEN0)|(1<<UDRIE0);enable interrupt to sent data
ret


IsrRec:;receive char
in  r18, UDR0 ; copy UDR to R17
       st X+,r18
       cpi r18,'$'
       brne keep_going
       ldi r16,0
       out UCSR0B,r16;disable interrupt
keep_going:reti


IsrTr:;send to terminal
ld r17,X+
out portb,r17
out UDR0,r17
cpi r17,'$'
brne keep_trans
ldi r16,0
out ucsr0b,r16;disable interrupt
keep_trans:RETI



.ORG 0x500
MSG1: .DB "What is your name ?",'\n','\r','$'
MSG2: .DB "Hello $"

;LDI R16,(1<<RXEN0)|(1<<RXCIE0); enable receiver and RXC0 interrupt
;ldi XL,LOW(0x400)
;ldi XH,HIGH(0x400)
;OUT UCSR0B, R16
```