Embedded Systems Lab Experiment 9

USART in ATMega 32

TO program ATMega32 microcontroller for USART communication

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DATE

Exp 9: Universal Synchronous Asynch Receiver Transmitter in AT Mega 32 μC

SHEET NO

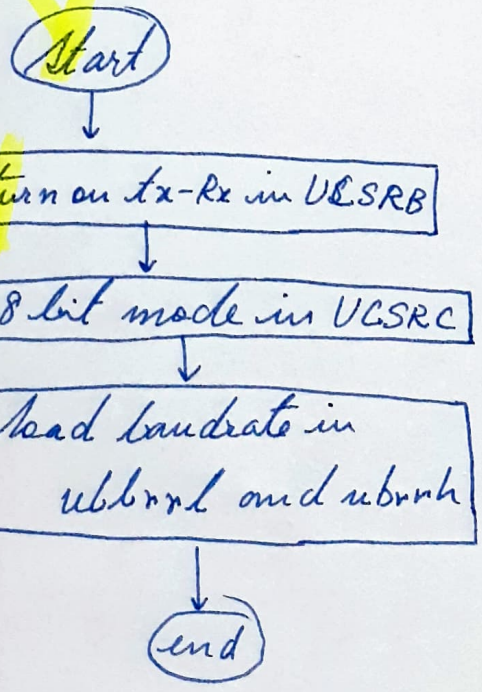
•> **Objective:** To program AT Mega 32 μC for USART comm.

•) **Apparatus reqd.:**

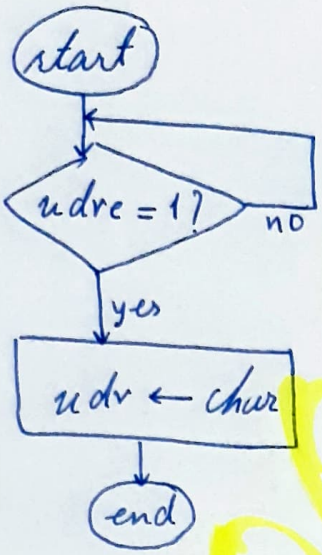
	Name	Specification	Quantity
1.	μC	AT Mega 32	1
2.	USB – UART conv	CP2102	1
3.	jumper wires	—	6

•> **Program flow:**

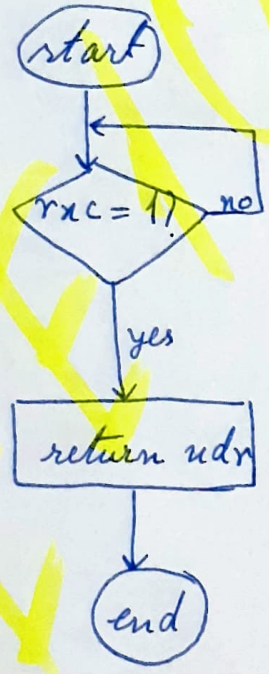
(i) **USART init:**



(ii) Tx_char:



(iii) Rx_char:



•) Code:

```
// basic imports
    call usart_init ------------>
main:
    call usart_rx char ---------> wait check for any input
    mov r26, r25 ---------------> ready to transmit
    call tx usart_tx char ------> transmit received data
    jmp main -------------------->
usart_init: ----------------->
    ldi r16, 0x18 ---------->  } ucsrb ← 0x18
    out ucsrb, r16 ---------->  }
    ldi r16, 0x86 ---------->  } ucsrc ← 0x86
    out ucsrc, r16 ---------->  }
    ldi r16, 0x33 ---------->  } ubrrl ← 0x33
    out ubrrl, r16 ---------->  }
    ldi r16, 0 ------------->  } ubrrh ← 0.
    out ubrrh, r16 ---------->  }
    ret. ------------------->
```

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```
usart_rxchar:
l1: in r16, ucsra        } check/poll for rxc in ucsra
    andi r16, 0x80       }
    breq l1
    in r25, udr          when rxc = 1 => receive complete
    ret                  r25 ← udr
usart_txchar:
u1: in r16, ucsra        } poll for udre in ucsra
    andi r16, 0x20       }
    breq u1
    out udr, r26         when udre = 1 => buffer empty
    ret                  udr ← r26 and transmit udr
```