Course name: Practical App. CS II
Course Code: -
Lecturer: Dr. Ahmed ElShafee

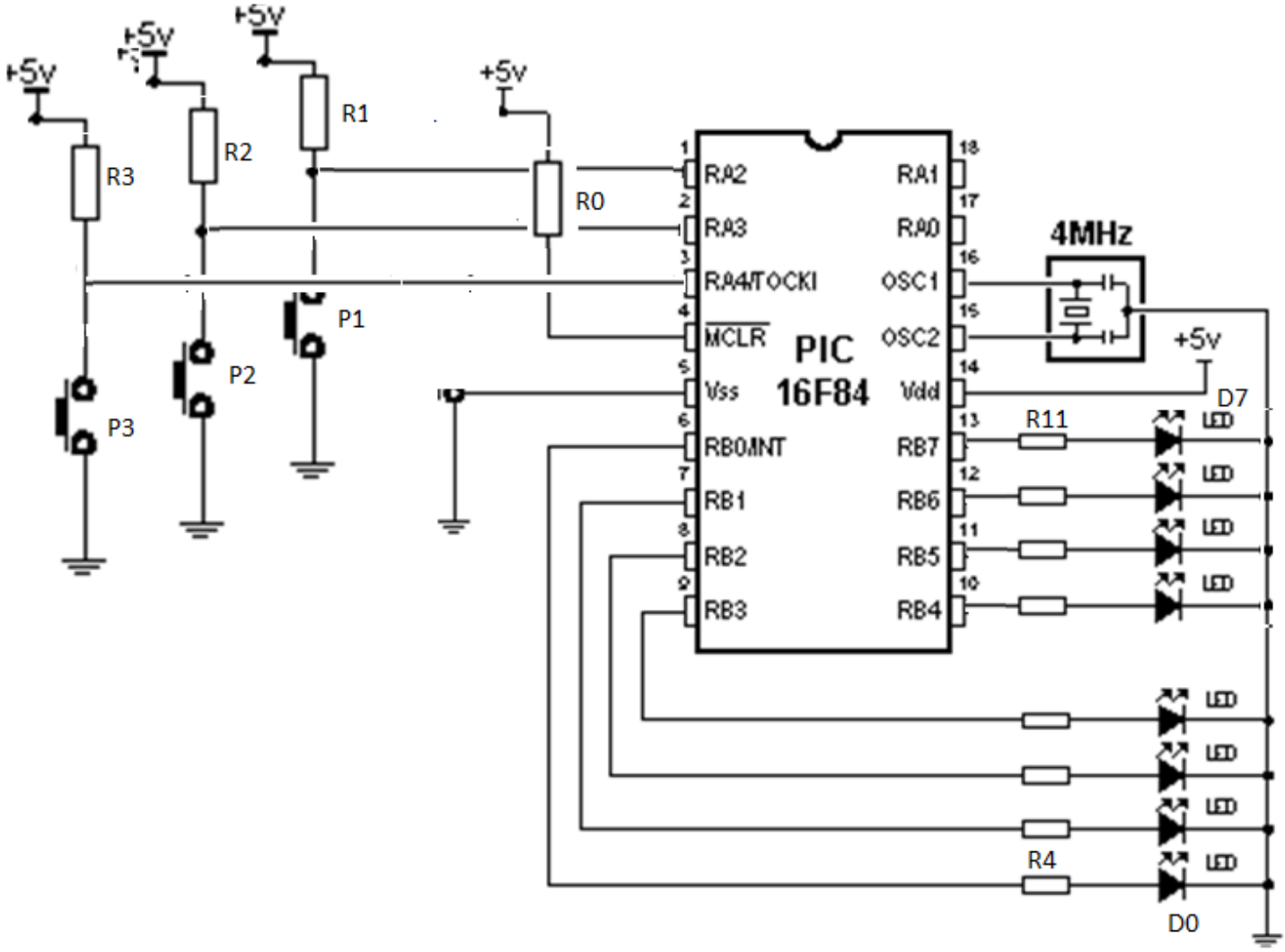
Exam number: Final, model answer
Exam Date: --/06/2013
Time Allowed: 120 minutes

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Total
/5	/5	/5	/5	/5	/5	/5	/5	/40

Q1

1. for the following schematic PIC16f84A microcontroller, complete the following assembly code do the following

1. leds (D0 →D7) counts up when pressing P1
2. leds (D0 →D7) counts down when pressing P2
3. leds (D0→D3) swap with (D4→D7) when pressing P3

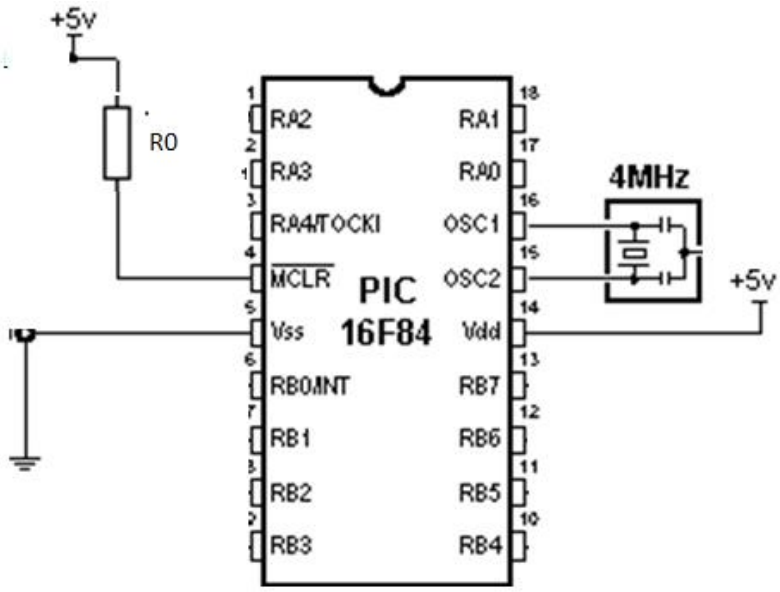
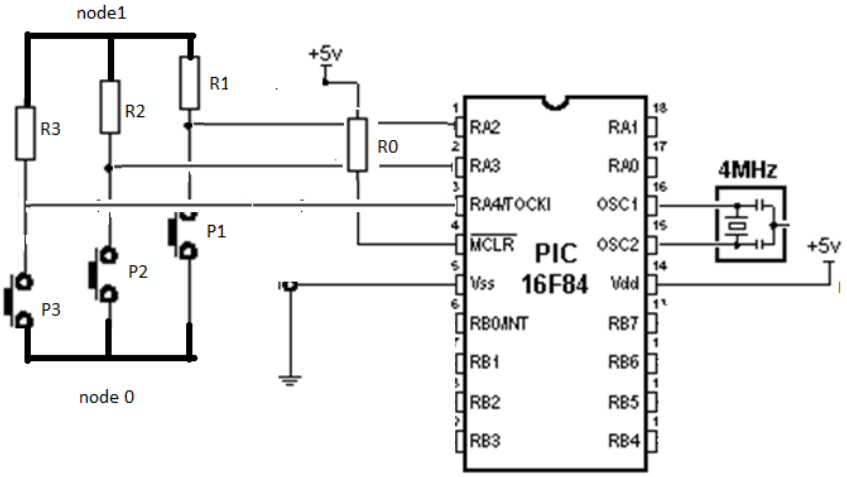


```
.ORG 000
        GOTO start
.org 004
        GOTO start
DELAY1S:
        MOVLW 0X05
        MOVWF 0X0E
DELAY1S_WAIT1:
        MOVLW 0XFF
        MOVWF 0X0D
DELAY1S_WAIT2:
        MOVLW 0XFF
        MOVWF 0X0C
DELAY1S_WAIT3:
        DECFSZ 0X0C,F
        GOTO DELAY1S_WAIT3
        DECFSZ 0X0D,F
        GOTO DELAY1S_WAIT2
        DECFSZ 0X0E,F
        GOTO DELAY1S_WAIT3
        RETURN
start:
        Bsf STATUS, RP0
        movlw b'00000000'
        movwf TRISB
        movlw b'11111111'
        movwf TRISA
        Bcf STATUS, RP0
        Movlw 0X00
        Movwf 0x0f
Loop:
        .....
        btfss porta,2
        call up
        btfss porta,3
        call down
        btfss portb,4
        call swap
        call DELAY1S
        .....
        Goto loop
```

```
up:
        incf 0x10,1
        movf 0x10,w
        movwf portb
        return
down:
        decf 0x10,1
        movf 0x10,w
        movwf portb
        Return
Swap:
        Swapf 0x10,1
        Movf 0x10,w
        Movwf portb
        return
```

Q2

2. complete the following table

Q	Answer
Value of R1, R2. R3	10K
R0	10K
R4 → R11	100 ohm
Add a press (P3) to act as hard reset for microcontroller	
Reconnect press P1, P2, and P3 to change its configuration from active low to active high or from active high to active low (node 0, and node 1)	 Node 0 to Vcc, Node 1 to Gnd

Make necessary modification to the assembly code to match the previous hardware modification	Loop: btfsc porta,2 call up btfsc porta,3 call down btfsc portb,4 call swap call DELAY1S Goto loop

Q3

3. you need to control the AC light of your room according to your door activity. The scenario is as follow

a. when you open the door for the first time the light will turn on immediatly

b. after closing the door, light remains on.

c. when you open the door for the second time, the light turns off after 20 seconds.

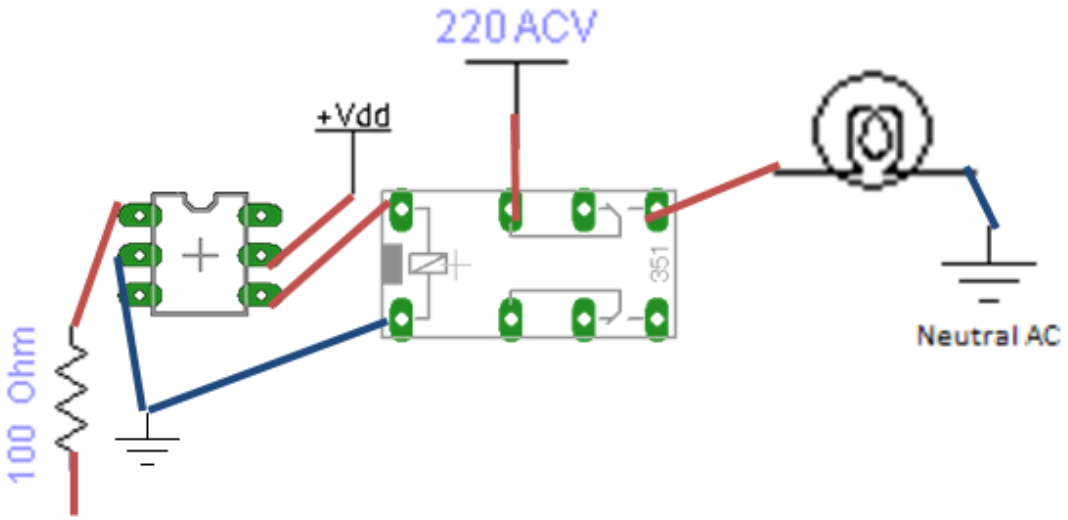
d. light remains of after closing the door, till you opened the door again.

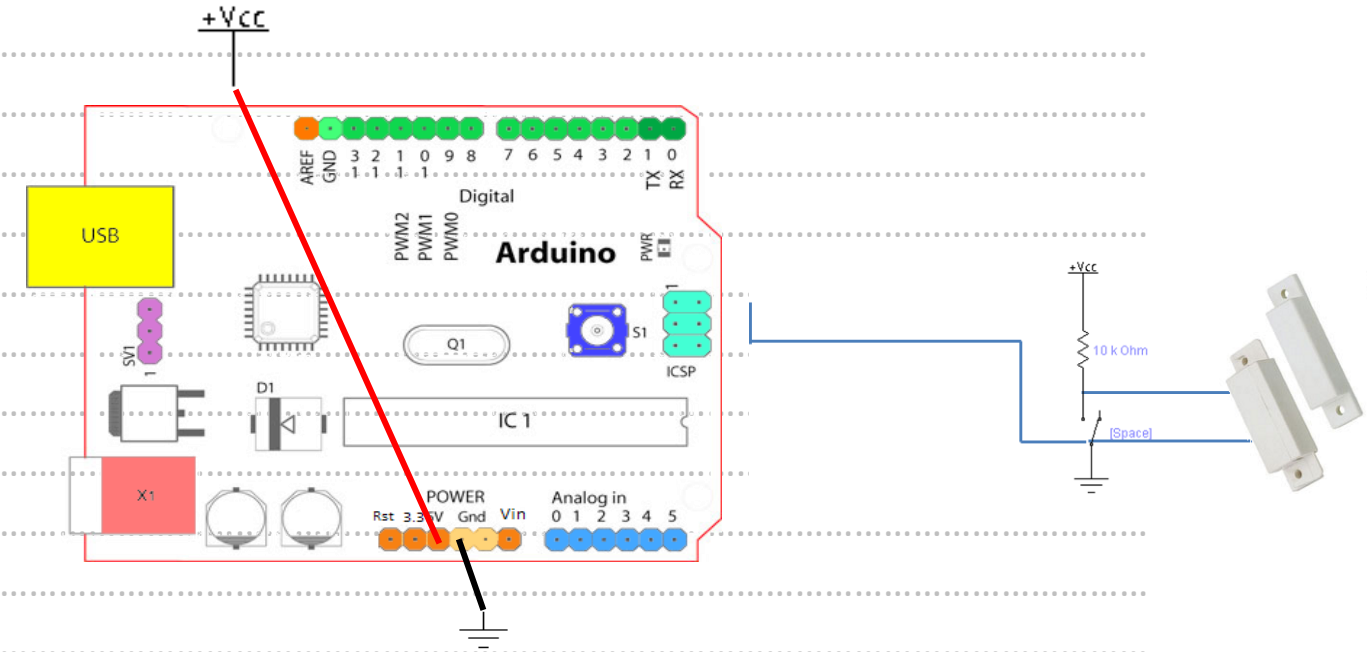
3.1 write the require components and their values the the following table

#	Component name	value
	Door sensor	
	R	I0K
	Optocopler isolator	4N35
	R	100
	Replay	12V
	Power socket + adapter 12V	

3.2 draw simple layout for your project

pin	Function
13	Light
7	door





3.3 build simple truth table summarizes the mentioned scenario (you will use that table to build the MC program)

Step #	Counter current status	Lamp current status	Door status	Action delay	Lamp next status	Counter next status
1	Off	Odd	Close	0	NC	NC
8	Off	Even	Close	0	NC	Counter ++
4	On	Odd	Close	0	NC	Counter ++
5	On	Even	Close	0	NC	NC
2	Off	Odd	Open	0	On	NC
7	Off	Even	Open	0	NC	NC
3	On	Odd	Open	0	NC	NC
6	On	Even	Open	5 Sec	Off	NC

.....

Step #	Counter current status	Lamp current status	Door status	Action delay	Lamp next status	Counter next status
1	Off	Odd	Close	0	NC	NC
2	Off	Odd	Open	0	On	NC
3	On	Odd	Open	0	NC	NC
4	On	Odd	Close	0	NC	Counter ++
5	On	Even	Close	0	NC	NC
6	On	Even	Open	5 Sec	Off	NC
7	Off	Even	Open	0	NC	NC
8	Off	Even	Close	0	NC	Counter ++

.....

.....

.....

.....

.....

.....

.....

Q4

4. write C program to execute mentioned scenario in question 3

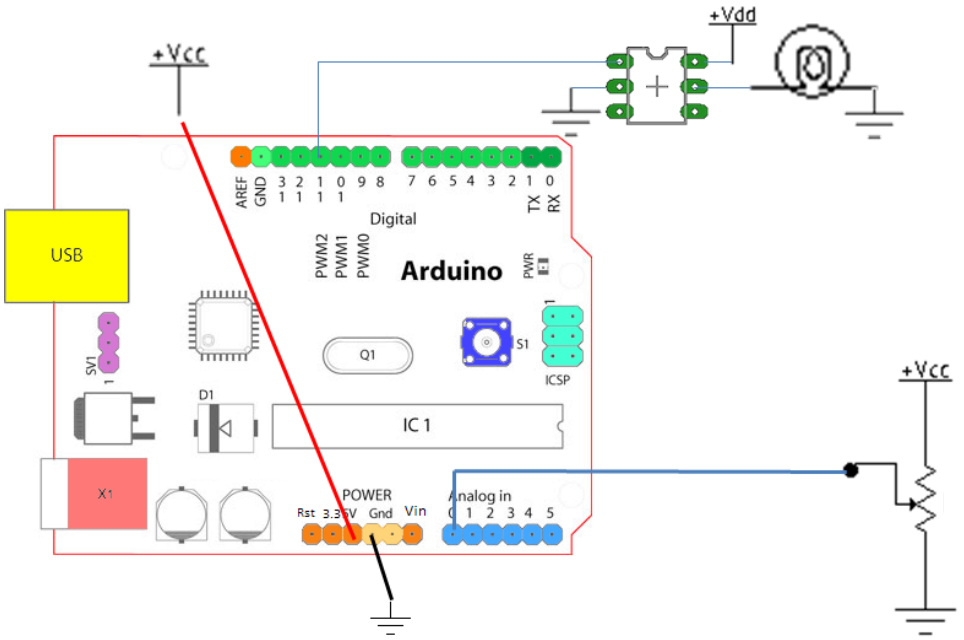
```
#define ACLamp 13
#define Door 7
int Door_status=0; //low close; high open
int ACLamp_status=0;
void setup()
{
  pinMode(ACLamp, OUTPUT);
  pinMode(Door,INPUT);
}
void loop()
{
  Door_status=digitalRead(Door);
  if((Door_status==LOW) && (ACLamp_status==0))
    ACLamp_status=0;

else if((Door_status==LOW) && (ACLamp_status==1))
  {
    delay(5000);
    ACLamp_status=0;
  }
  else if((Door_status==HIGH) && (ACLamp_status==0))
    ACLamp_status=1;
  else if((Door_status==HIGH) && (ACLamp_status==1))
    ACLamp_status=1;
      digitalWrite(ACLamp,ACLamp_status);;

}
```

Q5

5. for the following layout, Arduino MC uses potentiometer to control the intensity of light of a12 v DC Lamp



Complete the following table

Maximum expected input analog voltage to pin A0	5V
What is maximum digital value read by arduino if maximum analog voltage applied to A0	1023
Maximum allowed output voltage from pin 11	1.5V
What is maximum digital value can be written to pin 11 to produce maximum analog voltage	255
Name the used IC that interfaces Arduino to DC lamp	4N35 – optocoupler isolator

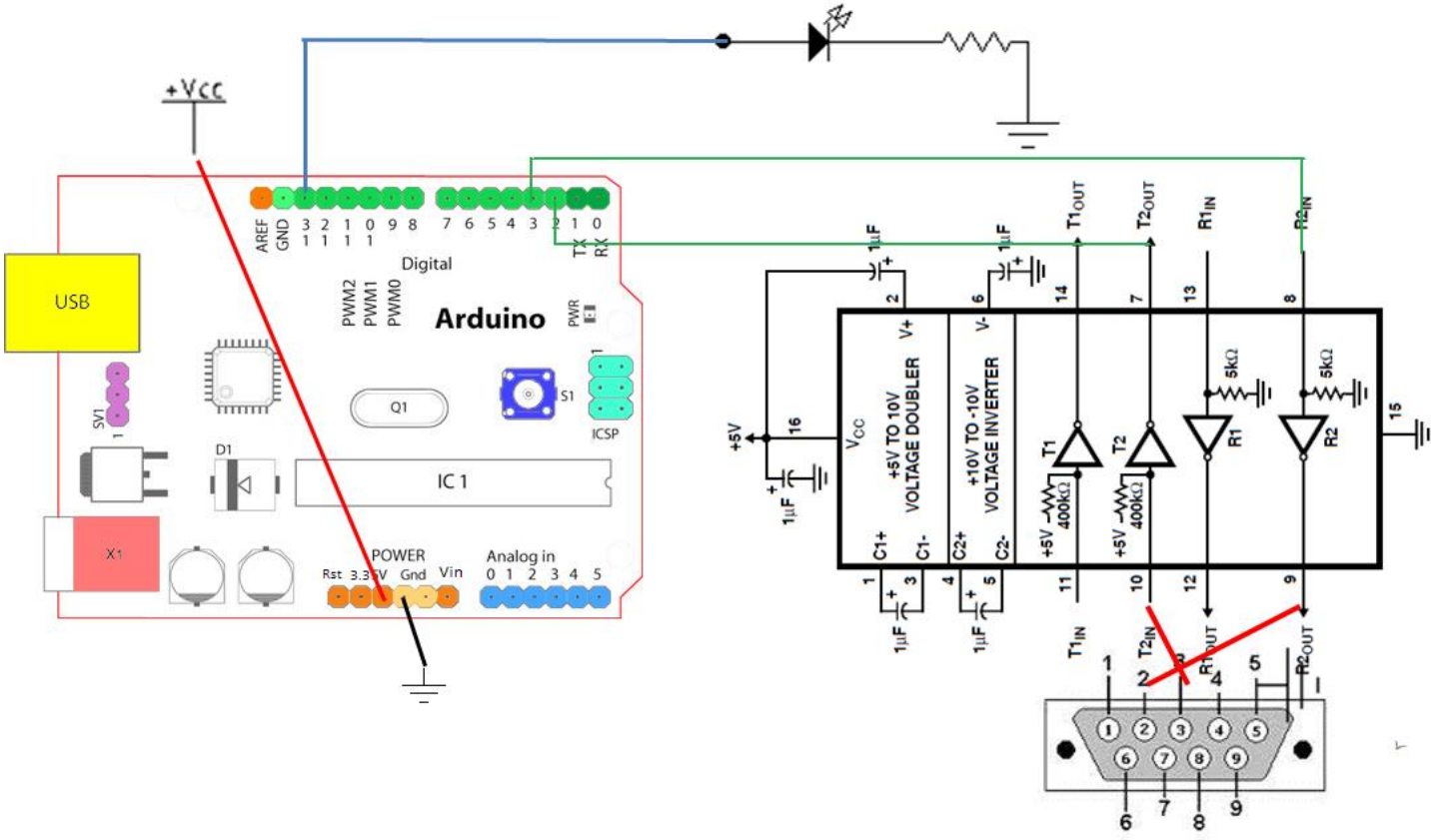
Q6

Write C program that make potentiometer controls the light intensity of DC lamp (layout of Q5)

```
#define Lamp 11
#define Potentiometer A0
int pot,lmp;
void setup()
{
  pinMode(Lamp,OUTPUT);
  pinMode(Potentiometer,INPUT);
}
void loop()
{
  pot=analogRead(Potentiometer);
 lmp=int(pot*1.5/5/4);
  analogWrite(Lamp,lmp);
}
```

Q7

To control a led from a PC, Arduino MC is used to interface a PC serial port to a Led, as shown in the following layout



7.1 Complete the following table

Name the IC that interface PC serial port to Arduino MC	Max232
State the main function of that IC	Converts PC voltage level to Arduino voltagelevels
State the function of Arduino pins 12, 13 respectively	Tx, Rx
State the function of PC serial port pins 2, & 3 respectively	Rx, Tx

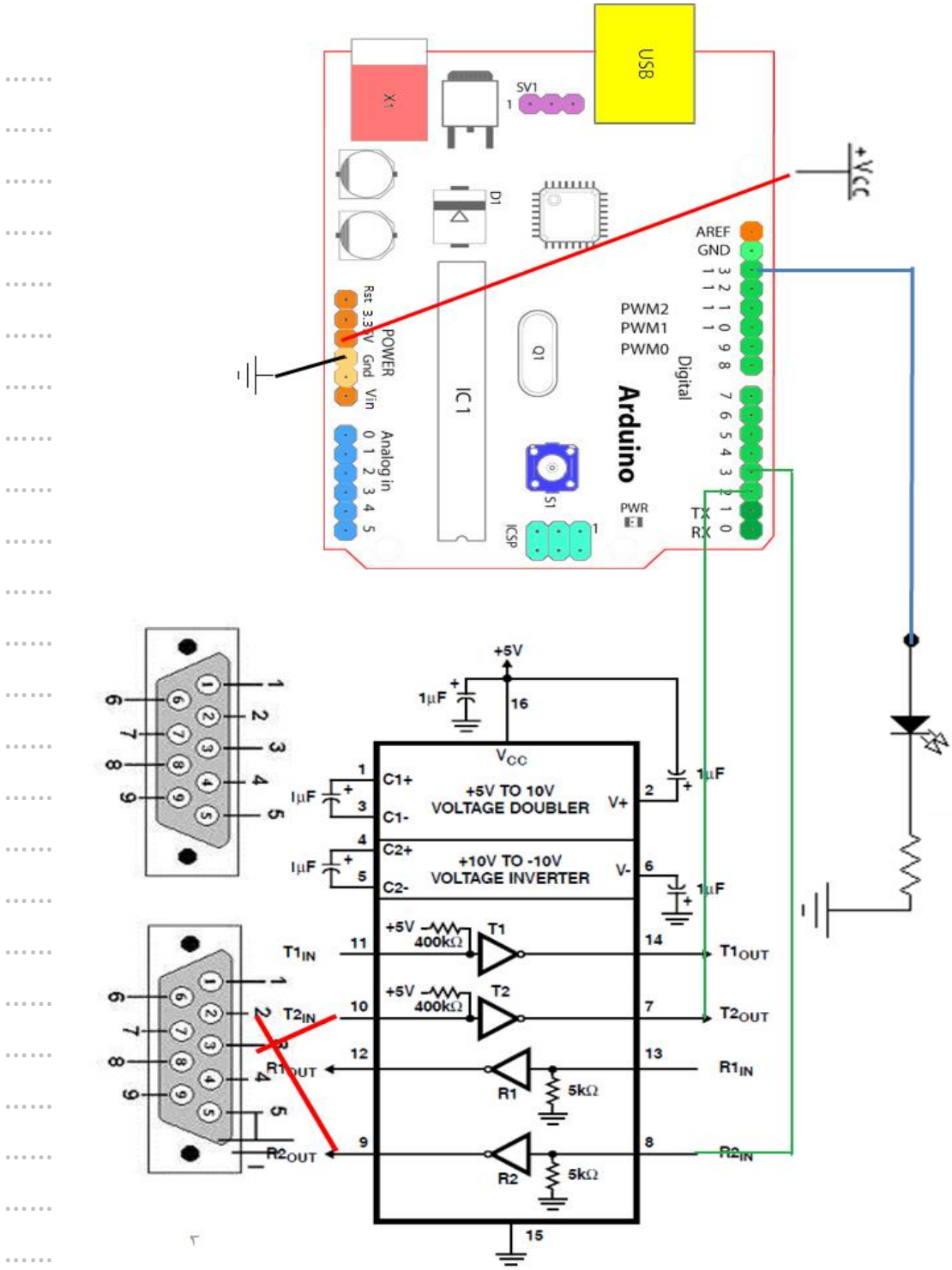
.....

.....

.....

.....

7.2 we will connect another PC to the same arduino MC, by using another DB9 female connector and the same interface IC, complete missing wire connections in the below layout



Q8

Write a software program in C, the toggle the led status when you press ‘a’ (ignore character case) letter on PC Terminal, Arduino write the led status on PC terminal. If any other key is press, Arduino sends “you typed: ” followed by the pressed key.

```
#include <SoftwareSerial.h>
SoftwareSerial mySerial(2, 3);
#define LED 13
int LED_status=0;
void setup()
{
mySerial.begin(9600);
  mySerial.println("wlcome to Serial controller..");
}
void loop() // run over and over
{
if (mySerial.available() > 0)
  {
     int inByte = mySerial.read();
  switch(inByte)
  {
    case 'a':
    case 'A':
      if(LED_status==LOW)
            LED_status=HIGH;
      else
        LED_status=LOW;
      digitalWrite(LED,LED_status);
      mySerial.print("Led now is = ");
      if(LED_status==LOW) mySerial.print("LOW");
      else mySerial.print("High");
      mySerial.println();
    break;
    default:
        mySerial.print("you typed = ");
        mySerial.print(inByte);
       mySerial.println();
    break;
  }
}
}
```