DEPARTMENT OF COMPUTER & SOFTWARE ENGINEERING

COLLEGE OF E&ME, NUST, RAWALPINDI

Subject: Microprocessor and Microcontroller Based Design

SUBMITTED TO:
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LAB # 08: Introduction to PIC Microcontroller – MPLAB and Proteus

Objectives:

To possess a foundational understanding of microcontroller programming and system design using Proteus.

Tasks:

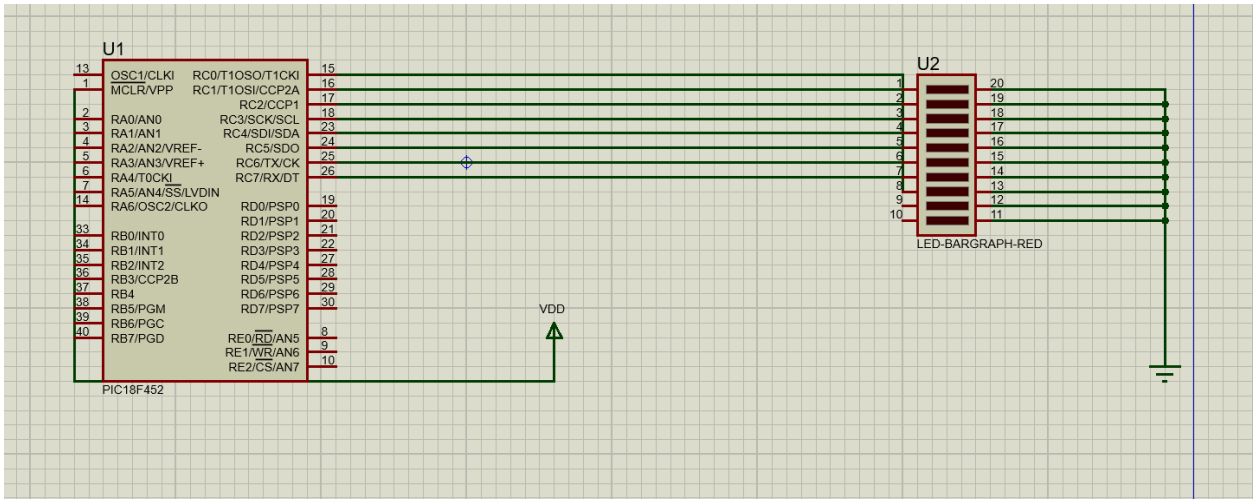
Task1:

Code:

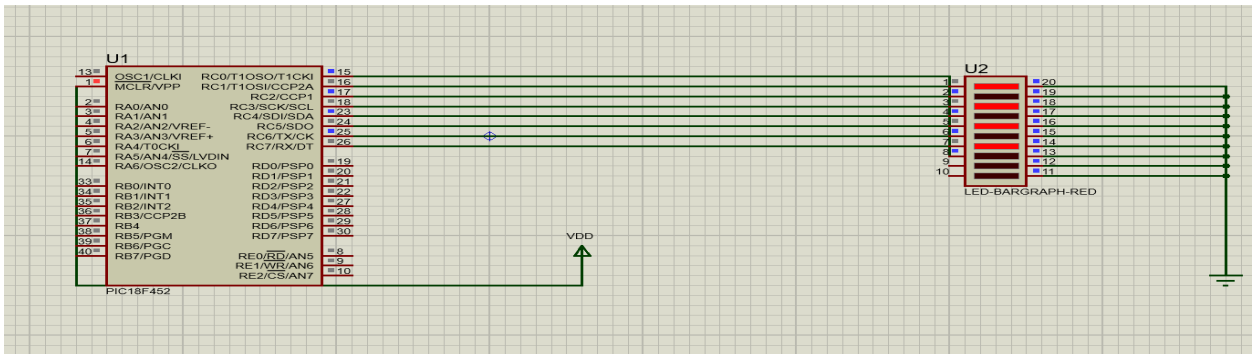
```
     LIST P=18F452           ; Specify the processor
    #include <p18f452.inc>  ; Include the device file for
PIC18F452


    ; Define delay count
    DELAY_COUNT EQU 0x20    ; Memory location for delay variable

    ORG 0x0000              ; Set program start address
    GOTO Start              ; Jump to the start of the program

Start:
    ; Initialize PORTD
    CLRF PORTC              ; Clear PORTC
    MOVLW 0x00              ; Set PORTD as output
    MOVWF TRISC

MainLoop:
    ; Turn on even LEDs (binary 10101010 = 0xAA)
    MOVLW 0xAA              ; Load W with 0xAA
    MOVWF PORTC             ; Set PORTC with even LEDs on
    CALL Delay              ; Call delay subroutine

    ; Turn off all LEDs
    CLRF PORTC              ; Clear PORTC (all LEDs off)
    CALL Delay              ; Call delay subroutine

    GOTO MainLoop           ; Repeat the loop

; Delay subroutine
Delay:
```

```
    MOVLW D'250'              ; Outer loop count
    MOVWF DELAY_COUNT         ; Move to delay variable
DelayLoop:
    NOP                       ; Do nothing (1 cycle)
    NOP                       ; Do nothing (1 cycle)
    DECFSZ DELAY_COUNT, F     ; Decrement delay count, skip if
zero
    GOTO DelayLoop            ; Repeat until DELAY_COUNT reaches 0
    RETURN

    END
```

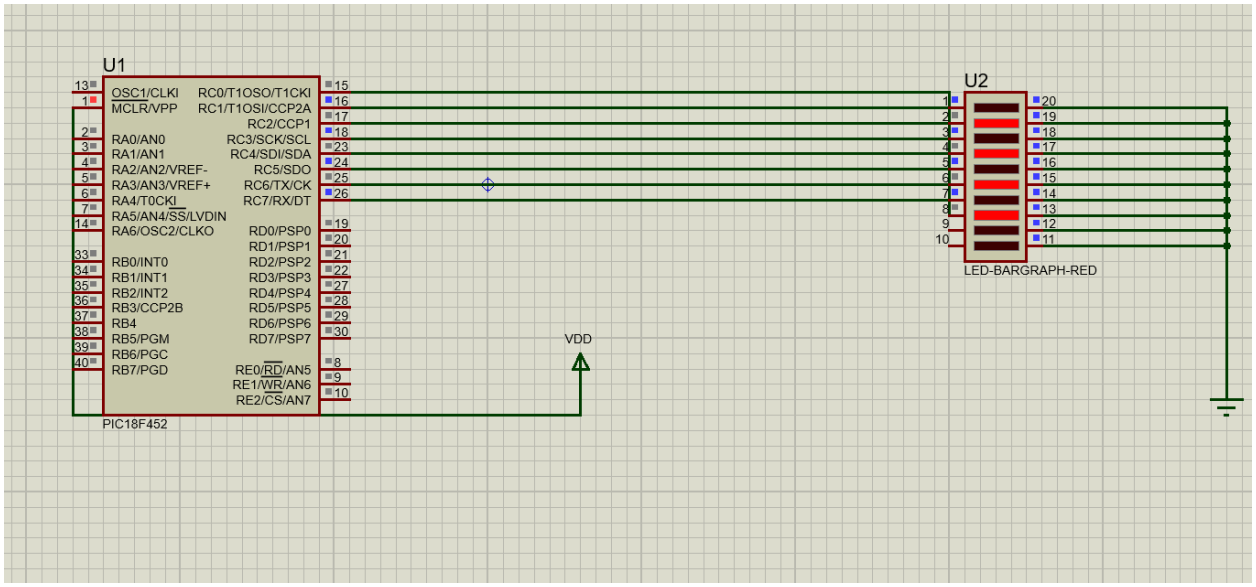
Proteus Schematic:



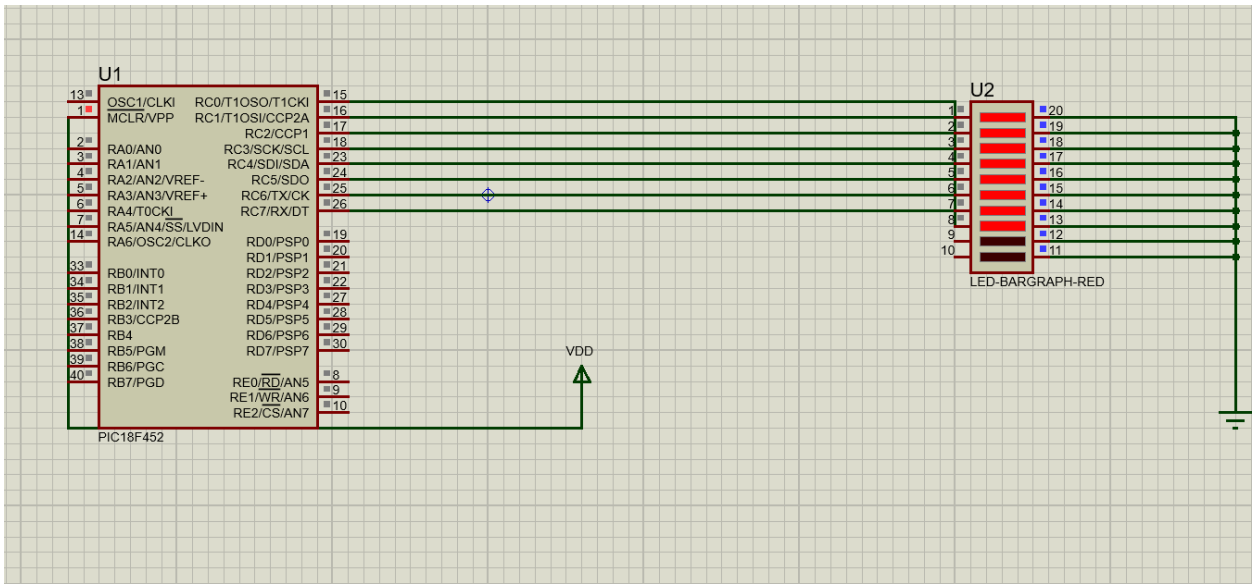
1. All Even LEDs:



2. All ODD LEDs:(0x55)



3. ALL LEDs:(0xFF)



Task#02:

From 0 to 9:

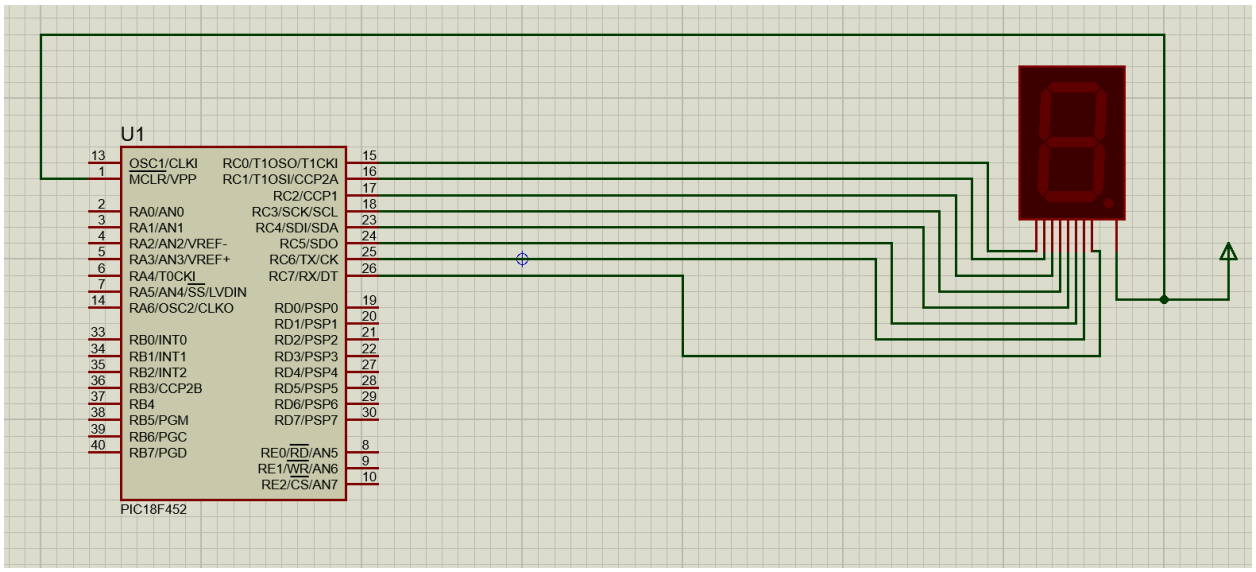
Code:

```
LIST P=18F452           ; Specify the processor
#include <p18f452.inc>  ; Include the device file for PIC18F452

; Define delay variables
DELAY_COUNT   EQU 0x20   ; Outer loop delay variable
DELAY_COUNT2  EQU 0x21   ; Middle loop delay variable

ORG 0x0000              ; Set program start address
GOTO Start              ; Jump to the start of the program

Start:
    ; Initialize PORTC
    CLRF PORTC              ; Clear PORTC
    MOVLW 0x00              ; Set PORTC as output
    MOVWF TRISC

MainLoop:
    ; Display pattern 0x3F (digit 0)
    MOVLW 0x3F
    MOVWF PORTC
    CALL Delay

    ; Display pattern 0x06 (digit 1)
    MOVLW 0x06
    MOVWF PORTC
    CALL Delay

    ; Display pattern 0x5B (digit 2)
    MOVLW 0x5B
    MOVWF PORTC
    CALL Delay

    ; Display pattern 0x4F (digit 3)
    MOVLW 0x4F
    MOVWF PORTC
```

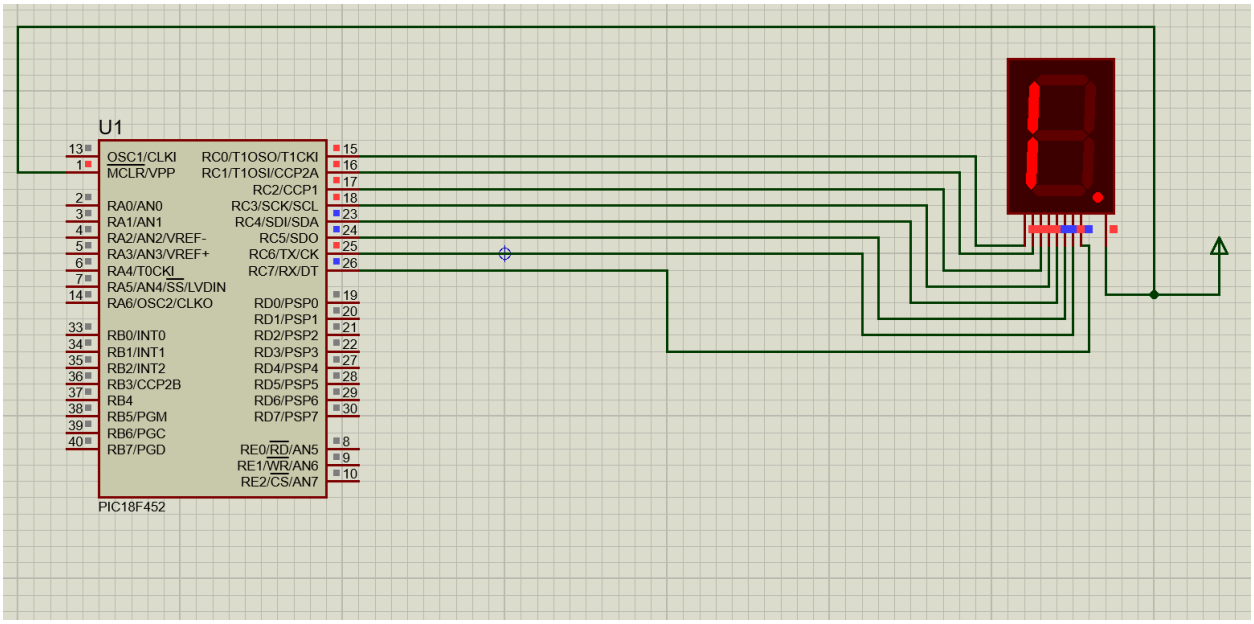
```
    CALL Delay

    ; Display pattern 0x66 (digit 4)
    MOVLW 0x66
    MOVWF PORTC
    CALL Delay

    ; Display pattern 0x6D (digit 5)
    MOVLW 0x6D
    MOVWF PORTC
    CALL Delay

    ; Display pattern 0x7D (digit 6)
    MOVLW 0x7D
    MOVWF PORTC
    CALL Delay

    ; Display pattern 0x07 (digit 7)
    MOVLW 0x07
    MOVWF PORTC
    CALL Delay

    ; Display pattern 0x7F (digit 8)
    MOVLW 0x7F
    MOVWF PORTC
    CALL Delay

    ; Display pattern 0x6F (digit 9)
    MOVLW 0x6F
    MOVWF PORTC
    CALL Delay

    GOTO MainLoop

; Delay subroutine for ~500ms
Delay:
    MOVLW D'25'           ; Outer loop count (adjust as needed
for ~500ms)
    MOVWF DELAY_COUNT
OuterLoop:
    MOVLW D'250'          ; Inner loop count
```

```
    MOVWF DELAY_COUNT2
InnerLoop:
    NOP                     ; 1 cycle (do nothing)
    NOP                     ; 1 cycle (do nothing)
    DECFSZ DELAY_COUNT2, F ; Decrement inner loop counter
    GOTO InnerLoop          ; Repeat until DELAY_COUNT2 reaches 0
    DECFSZ DELAY_COUNT, F  ; Decrement outer loop counter
    GOTO OuterLoop          ; Repeat until DELAY_COUNT reaches 0
    RETURN
     END
```

Schematic:



Output:



From 9 to 0:

```
LIST P=18F452            ; Specify the processor
#include <p18f452.inc>   ; Include the device file for
PIC18F452

; Define delay variables
DELAY_COUNT   EQU 0x20    ; Outer loop delay variable
DELAY_COUNT2  EQU 0x21    ; Middle loop delay variable

ORG 0x0000               ; Set program start address
GOTO Start               ; Jump to the start of the program

Start:
    ; Initialize PORTC
    CLRF PORTC               ; Clear PORTC
    MOVLW 0x00               ; Set PORTC as output
    MOVWF TRISC

MainLoop:
    ; Display pattern 0x6F (digit 9)
    MOVLW 0x6F
    MOVWF PORTC
```

```
CALL Delay

; Display pattern 0x7F (digit 8)
MOVLW 0x7F
MOVWF PORTC
CALL Delay

; Display pattern 0x07 (digit 7)
MOVLW 0x07
MOVWF PORTC
CALL Delay

; Display pattern 0x7D (digit 6)
MOVLW 0x7D
MOVWF PORTC
CALL Delay

; Display pattern 0x6D (digit 5)
MOVLW 0x6D
MOVWF PORTC
CALL Delay

; Display pattern 0x66 (digit 4)
MOVLW 0x66
MOVWF PORTC
CALL Delay

; Display pattern 0x4F (digit 3)
MOVLW 0x4F
MOVWF PORTC
CALL Delay

; Display pattern 0x5B (digit 2)
MOVLW 0x5B
MOVWF PORTC
CALL Delay

; Display pattern 0x06 (digit 1)
MOVLW 0x06
MOVWF PORTC
CALL Delay
```

```
    ; Display pattern 0x3F (digit 0)
    MOVLW 0x3F
    MOVWF PORTC
    CALL Delay

    GOTO MainLoop           ; Repeat the loop

; Delay subroutine for ~500ms
Delay:
    MOVLW D'25'           ; Outer loop count (adjust as
needed for ~500ms)
    MOVWF DELAY_COUNT
OuterLoop:
    MOVLW D'250'          ; Inner loop count
    MOVWF DELAY_COUNT2
InnerLoop:
    NOP                   ; 1 cycle (do nothing)
    NOP                   ; 1 cycle (do nothing)
    DECFSZ DELAY_COUNT2, F ; Decrement inner loop counter
    GOTO InnerLoop        ; Repeat until DELAY_COUNT2
reaches 0
    DECFSZ DELAY_COUNT, F  ; Decrement outer loop counter
    GOTO OuterLoop        ; Repeat until DELAY_COUNT
reaches 0
    RETURN
    END
```