MICROCHIP AUTHORISED TRAINING PARTNER

EMTECH igniting minds...

STEP EMBEDDED SYSTEM DESIGN (INTERMEDIATE) LAB PRACTICE PROBLEMS

Sr. No.	Topics
1	**Number System**
1.1	**Number System Conversion**
1.1.1	Conversion of Decimal number to Binary, Octal & Hexadecimal
1.1.2	Conversion of Binary number to Decimal, Octal & Hexadecimal
1.1.3	Conversion of Octal number to Binary, Decimal & Hexadecimal
1.1.4	Conversion of Hexadecimal number to Binary, Octal & Decimal
1.2	**Arithmetic Operations**
1.2.1	Addition with Binary, Octal & Hexadecimal Numbers
1.2.2	Subtraction with Binary, Octal & Hexadecimal Numbers
1.3	**Memory Addressing**
1.3.1	Calculating Last Address of Memory when Size is given
1.3.2	Calculating Size of Memory when Last Address is given
2	**LED Patterns**
2.1	LED Blinking
2.2	LED Blinking for 25 times only
2.3	Left Rotation of LEDs
2.4	Right Rotation of LEDs
2.5	Convergence
2.6	Divergence
2.7	Convergence & Divergence
2.8	Binary Counter
2.9	Sand Glass (as Assignment)

3 Linear Switch (Key)

3.1 Single Key → Key Press LEDs ON & Key Release LEDs OFF

3.2 Two Key → Key1 Press LEDs ON & Key2 Press LEDs OFF

3.3 3 Keys 8 LEDs → Key1 Press Only 1st 4 LEDs ON,Key2 Press Only last 4 LEDs ON, Key3 Press all LEDs Off

3.4 Key Toggle → LEDs Status will change when Key Pressed then Release (Like Window Button in PC Keyboard)

3.5 Multi Keys Multi Functions (5 Keys 5 Functions) in C Programming

- Key1 → LED Blinking
- Key2 → LEDs Rotate Left
- Key3 → LEDs Rotate Right
- Key4 → Convergence & Divergence
- Key5 → All LEDs OFF

4 C Programming (Provide Solved Programs to students, They need to Execute only)

4.1 Basic C Programs

4.1.1 Arithmetic Oprerations of Two Numbers (Addition, Subtraction, Multiplication & Divison)

4.1.2 Temperature Conversion (Degree Celsius to Fahrenheit)

4.1.3 Calculating the Sum of digits of a 5 Digit Number

4.2 if - else Programs

4.2.1 Find out the Largest number from 3 numbers

4.2.2 Find out whether the entered number is EVEN or ODD

4.3 Loops & Arrays Programs

4.3.1 Print the counting from 1 to 10 using for, while and do-while loops

4.3.2 Enter 10 numbers, store them to array & find the sum and Average

4.3.3 Print any pattern using nested for loop

4.4 Functions

4.4.1 Simple function calling for doing Arithmetic Operation of two Numbers

4.4.2 Function Calling by value for doing Arithmetic Operation of two Numbers

5 Seven Segment Display (SSD)

5.1 Single SSD

5.1.1 0-9 Counting

5.1.2 9-0 Counting

5.1.3 0-9-0 Counting

5.2 Single SSD Controlled by Switch

5.2.1 Two Keys → Key1 to increase count & Key2 to decrease count

5.3 Double SSD on two Separate PORTs

5.3.1 00 - 99 Counting

5.3.2 99 - 00 Counting

5.3.3 0 - 99 Counting

Keys→ LEDs↓	S1	S2	S3	S4	S5	S6	S7	S8
LED1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
LED2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
LED3	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
LED4	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
LED5	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
LED6	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
LED7	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
LED8	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON

6 Keypad Matrix

6.1 LEDs Controlled by Keypad Matrix

6.1.1 8 LEDs controlled by 8 Keys(4x2 Keypad)

6.1.2 8 LEDs controlled by 16 Keys(4x4 Keypad)

Keys→ LEDs↓	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16
LED1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
LED2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
LED3	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	ON	OFF
LED4	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	ON	OFF
LED5	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	OFF
LED6	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	OFF
LED7	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	OFF
LED8	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	ON	OFF

6.2 SSD Controlled by Keypad Matrix

6.2.1 Displaying 0-9 & A-F on SSD by corresponding 16 Keys(4x4 Keypad)

7 Multi Seven Segment Display (MSSD)

7.1 Displaying any 4 Digit number

7.2 0000 - 9999 Counting

7.3 9999 - 0000 Counting

7.4 0 - 9999 Counting (Assignment)

8 Liquid Crystal Display (LCD)

8.1 Display any Character on LCD

8.2 Display Your Name on LCD

8.3 Display "EMTECH FOUNDATION" in 1st line & "Igniting Minds ***" in 2nd line

8.4 Scroll Above Message toward →(i)Left , (ii) Right

8.5 Display Countings →0-9 , 9-0, 00- 99

8.6 Display any 5 Digit Number on LCD (Assignment)

9 Timers

9.1 Timer0 Delay Generation

9.1.1 255 us

9.1.2 250 us

9.1.3 500 us

9.1.4 1 ms

9.1.5 100 ms

9.1.6 500 ms
9.1.7 1 s

9.2 Timer1 Delay Generation

9.2.1 500 us
9.2.2 1 ms
9.2.3 100 ms
9.2.4 1 s

10 R,L,C Circuits Simulation

10.1 Simulation of Resistance Voltage Divider Circuits
10.2 Simulation of Voltage Divider Circuits using Variable Resistace (Potentiometer) & LDR

11 Power Supply Circuits Simulation

11.1 Simulation of Fixed +ve Power Supply
11.2 Simulation of Fixed -ve Power Supply
11.3 Simulation of Fixed Dual Power Supply

12 Relay & Buzzer Circuits Simulation

12.1 Two Relays blinking
12.2 Two Relays Controlled by 2 Keys(Relay toggle)
12.3 Buzzer Controlled by Key

13 Motors' Circuits Simulation

13.1 DC Motor Control

13.1.1 Clockwise & Anticlockwise Rotation using 2 C/O Relay
13.1.2 Clockwise & Anticlockwise Rotation using L293D IC Relay
13.1.3 DC Motor Control Using 3 Keys (Clockwise,Anticlockwise & Stop)

13.2 Stepper Motor Control

13.2.1 Clockwise & Anticlockwise Rotation using ULN IC
13.2.2 Stepper Motor Control Using 3 Keys (Clockwise,Anticlockwise & Stop)

14 Interrupt

14.1 Timer0 Interrupt → LEDS Blinking on One PORT with Timer0 Interrupt & LEDS Blinking on Other PORT with Normal Delay
14.2 Timer1 Interrupt →LEDS Blinking on One PORT with Timer1 Interrupt & SSD Counting(0-9) on Other PORT with Normal Delay

14.3 External Interrupt →SSD Count(0-9) Increment on One PORT with External Interrupt & LEDS Blinking on Other PORT with Normal Delay

15 Analog to Digital Converter(ADC)

15.1 Read the ADC Value and Display it on LCD
15.2 Read the Analog Value of Temperature Sensor(LM35) & Display the Corresponding Temp. on LCD
15.3 Read the Analog Value of Two Temperature Sensors(LM35) & Display the Corresponding Temp. on LCD(1st & 2nd Line)

16 Universal Asynchronous Receiver Transmitter(UART)

16.1 Transmit any Character on Virtual Terminal
16.2 Transmit "EMTECH FOUNDATION"
16.3 Receive any Character from Virtual Terminal & Display it on LCD
16.4 Receive "EMTECH FOUNDATION" & Display "EMTECH" in 1st Line and "FOUNDATION" in 2nd Line o LCD

17 Internal EEPROM

17.1 Write any 8-bit value at any location of EEPROM
17.2 Read the value & display it on any PORT
17.3 Write the SSD value from 00H to 0AH Locations of EEPROM
17.4 Read SSD value & display on SSD and do→(i) 0-9 Counting, (ii) 9-0 Counting

18 De-Soldering & Soldering

18.1 De-Soldering the Components from Old PCB & Indetify them
18.2 Practice of Wire Tinning & Solder the wire to write your name

19 Hardware & Software Testing Techniques