Lab 7: Arithmetic and Logic Operations with 8051

1 Problem Statement

Write assembly program to:

1. Add of two 8 bit numbers:
   (a) Store any two 8-bit numbers in register R0 and memory location 40H, respectively.
   (b) Perform addition of these two 8-bit numbers.
   (c) Store the result in memory location 42H and carry in memory location 44H.
   (d) Display the *hex value* of sum and carry on first and second line of the LCD.
2. Subtraction of two 8 bit numbers:
   (a) Perform subtraction of an immediate value from the obtained sum (i.e. content of memory location 42H)
   (b) Use appropriate logical operations to separate out the lower and upper nibbles of the result obtained and store in separate registers
   (c) Display the upper and lower nibble on onboard LEDs of Pt-51 kit with an equal noticeable time delay between the nibbles.

2 Supportive materials

2.1 Program for Binary to ASCII conversion

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ASCII:
  ANL A,#0FH  ;Extracting lower nibble
  MOV R3,A    ;Store the value in a temporary variable
  SUBB A,#0AH ;Check whether the nibble is digit or alphabet
  JNC ALPHABET;Jump to routine ALPHABET if it is an alphabet
 NUM:
  MOV A,R3    ;If it is a digit, move it to accumulator
  ADD A,#30H  ;Add 30H to convert a digit to ASCII
  JMP EXITASCII
 ALPHABET:
  MOV A,R3    ;If it is an alphabet, move it to accumulator
  ADD A,#37H  ;Add 37H to convert a character to ASCII
  JMP EXITASCII
 EXITASCII:
  RET
```

2.2 Some useful Arithmetic and Logic commands

Arithmetic Instructions:

ADD A,Rn: Contents of register Rn is added to register A and result is stored in A

ADDC A,Rn: Contents of register Rn is added to register A. The carry bit is also added to the result and stored in register A

SUBB A,Rn: Content of Rn will be subtracted from contents of register and result is stored in A

INC Rn: Content of register Rn will be incremented by 1

DEC Rn: Decreases the value stored in Rn register by 1

MUL AB: Multipiles the contents of register A and B

DIV AB: This instruction is used to divide the content of A register by B register

Logical Instructions:

ANL A, Rn - Content of Rn will be ANDed with register A and the result is strored into A

ORL A,Rn - Content of Rn will be ORed with register A and the result is strored into A

XRL A,Rn - Content of Rn will be XORed with register A and the result is strored into A

CLR A - Content of the register A will be cleared and resulting content wil be 00H

CPL A - Each bit of register A is complemented

SWAP A - Instruction to swap upper and lower nibbles of register A