

Assumptions:

- Arithmetic Operations performed on two 4 digit positive integer numbers.
- Logical Operations are performed on 1 digit number between 1 to 15.
- 1st operand is already loaded in R by user before performing any operation except Logical NOT.
- 2nd operand is in memory location provided by user with respective instruction.
- Result generated by Logical operations is 4 bit AND,OR,NOT,XOR of each bit of given input digit.
- User does not perform a “divide by zero error”.

Notations:

R : General Purpose Register (4bytes)

R1: General Purpose Register(4 bytes)

R2: General Purpose Register (4bytes)

F: Carry Bit (1byte)

1)AD- Addition

2) SU- Subtraction

3)ML-Multiplication

4)DV- Division

5)AN-Logical AND

6)OR-Logica OR

7)NT -Logical Not

8)XR – ExOR

ARITHMATIC OPERATIONS

AD : op1 = R

 R1 ← M[RA]

 op2 = R1

 R1 ← op1 + op2

 If Carry == 1

 R2 ← op1 + op2

$M[RA] = R1$
 $M[RA+1] = R2$

Else

$M[RA] = R1$

SU : $op1 = R$
 $R1 \leftarrow M[RA]$
 $op2 = R1$
 $R1 \leftarrow op1 - op2$
 If Borrow == 1
 $R2 \leftarrow op1 - op2$
 $M[RA] = R1$
 $M[RA+1] = R2$
 Else
 $M[RA] = R1$

ML: $op1 = R$
 $R1 \leftarrow M[RA]$
 $op2 = R1$
 $R1 \leftarrow op1 * op2$
 If Carry == 1
 $R2 \leftarrow op1 * op2$
 $M[RA] = R1$
 $M[RA+1] = R2$
 Else

$M[RA] = R1$

DV: $op1 = R$
 $R1 \leftarrow M[RA]$
 $op2 = R1$
 $R1 \leftarrow op1 / op2$
 $R2 \leftarrow op1 \% op2$
 $M[RA] = R1$ //Quotient
 $M[RA+1] = R2$ //Remainder

Logical Operations

AN: $op1 = R$
 Convert $op1$ to Binary 4 bit
 $op2 = R1$
 Convert $op2$ to Binary 4 bit
 LOOP
 For each bit in Registers do:
 If $R[i] == 1 \ \&\& \ R1[i] == 1$
 Result = 1
 Else
 Result = 0
 END LOOP
 $R1 \leftarrow Result$
 $M[RA]=R1$

OR: $op1 = R$

Convert op1 to Binary 4 bit

op2 = R1

Convert op2 to Binary 4 bit

LOOP

For each bit in Registers do:

If $R[i] == 0 \ \&\& \ R1[i] == 0$

Result = 0

Else

Result = 1

END LOOP

$R1 \leftarrow \text{Result}$

$M[RA] = R1$

NT: op1 = R

Convert op1 to Binary 4bit

LOOP

For each bit in Register do:

If $R[i] == 0$

result= 1

Else

result= 0

END LOOP

$R \leftarrow \text{result}$

$M[RA]=R$

XR: op1 = R

Convert op1 to Binary 4 bit

op 2 = R1

Convert op2 to Binary 4 bit

LOOP

For each bit in Registers do:

If $R[i] == R1[i]$

Result = 0

Else

Result = 1

END LOOP

$R1 \leftarrow \text{Result}$

$M[RA] = R1$