

AIM:- Study Of ALU, components and it's operations

INTRODUCTION TO ALU:

In computing, an arithmetic logic unit (ALU) is a digital circuit that performs arithmetic and logical operations. The ALU is a fundamental building block of a central processing unit (CPU) of a computer. and even the simplest microprocessors contain one for purposes such as managing memory. The processor found inside modern CPU and graphics cards accommodate very powerful and very complex ALUs. A single component may contain a number of ALUs.

Arithmetic Operations includes (a) Addition (+) (b) Subtraction (-)
(c) multiplication (x) (d) division (/) (e) Increment/Decrement (+1, -1)

Logical Operations includes (a) And (A) (b) OR (V) (c) XOR (t)

(d) NOT (7) (e) Comparison operators ($>=$, \leq)

Components Of ALU are?

1. Operand Register

2. Operational control Unit

3. Arithmetic Unit

4. Logic Unit

5. Accumulator

6. Flag registers

Working:

1. The CU sends an instruction to ALU
2. ALU fetch required operands from Registers / memory
3. It performs specified arithmetic or logic operation
4. Result is stored in a register or sent back to memory
5. Any status (like overflow, zero result) are updated in memory

OBSERVATION TABLE:

Function Select IP					Active LO Operands	
Logic					Arithmetic M=L	
S_3	S_2	S_1	S_0	M=N	$I(n=L)$	$I(n=H)$
L	L	L	L	/A	A MINUS 1	A
L	L	L	H	/AB	AB MINUS 1	AB
L	L	H	L	/A+B	A+B MINUS 1	A+B
L	L	H	H	Logic '1'	A MINUS 1 (2's Comp)	ZERO
L	H	L	L	/($A+B$)	A PLUS ($A+B$)	A PLUS ($A+B$) PLUS 1
L	H	L	H	/B	AB PLUS ($A+B$)	AB PLUS ($A+B$) PLUS 1
L	H	H	L	/($A \oplus B$)	A MINUS B MINUS 1	A MINUS B
L	H	H	H	A+B	A+B	(A+B) PLUS 1
H	L	L	L	/AB	A PLUS (A+B)	A PLUS (A+B) PLUS 1
H	L	L	H	A \oplus B	A PLUS B	A PLUS B PLUS 1
H	L	H	L	B	AB PLUS (A+B)	AB PLUS (A+B) PLUS 1
H	L	H	H	A+B	A+B	(A+B) PLUS 1
H	H	L	L	Logic '0'	A PLUS A	A PLUS A PLUS 1
H	H	L	H	A/B	AB PLUS A	AB PLUS A PLUS 1
H	H	H	L	AB	A/B PLUS A	A/B PLUS A PLUS 1
H	H	H	H	A	A	A PLUS 1

Table 2)

Function Select IP					Active HI Operands	
Logic					Arithmetic M=L	
S_3	S_2	S_1	S_0	M=N	$I(n=n)$	$I(n=L)$
L	L	L	L	/A	A	A PLUS 1
L	L	L	H	/AB	A+B	(A+B) PLUS 1
L	L	H	L	/A+B	A+B	(A+B) PLUS 1
L	L	H	H	Logic '0'	MINUS 1 (2's Comp)	ZERO
L	H	L	L	/AB	A PLUS A/B	A PLUS (A/B) PLUS 1

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L H L H	PB	(A+B) PLUS A ₁ B	(A+B) APLUS (A ₁ B) PLVI 2
L H H L	A ₁ B	A MINUS B MINUS 1	A MINUS B
L H H H	A ₁ B	A ₁ B MINUS 2	A ₁ B
H L L L	(A+B)	A PLVI AB	A PLUS AB PLVI 2
H L L H	(A+B)	A PLUS B	A PLUS B PLUS 2
H L H L	B	(A+B) PLUS AB	(A+B) PLUS AB PLUS 2
H L H H	AB	AB MINUS 1	AB
H H L L	Log& 'L'	A PLUS A ₁	A PLUS A PLUS 1
H H L H	A ₁ B	(A+B) PLUS A	(A+B) PLUS A PLUS 1
H H H L	A ₁ B	(A+B) PLUS A	(A+B) PLUS A PLUS 1
H H H H	A	A MINUS 2	A

AIM: TO perform A MINUS B MINUS 1

PROCEDURE:

Supply AC to the circuit as internally provided

1. Connect AC supply to PCB
2. set input switches S₁-S₁₁ electrically on 'L' position
3. Switch ON POWER

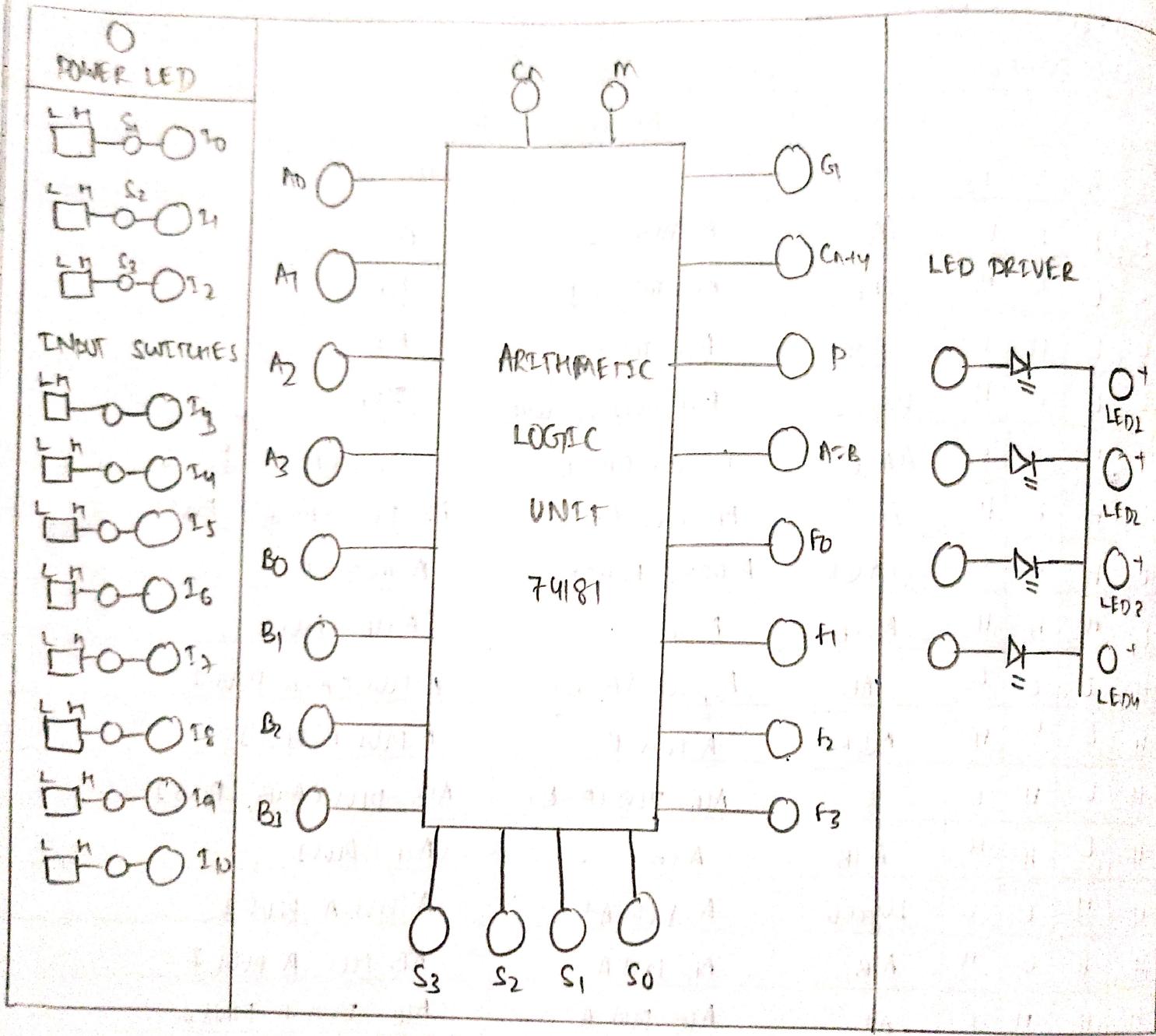
A MINUS B MINUS 1:

- (i) connect S₀ to A₀, S₁ to A₁, S₂ to A₂, S₃ to A₃, S₄ to B₀, S₅ to B₁, S₆ to B₂, S₇ to B₃, S₈ to S₀, S₉ to S₂S₁, S₁₀ to CN & M
- (ii) connect output of ALU (F₀-F₃) to LED devices Input (T₁-T₄) to obtain output

Active low Operand table should be followed

Input Required			Switching Condition		
S ₀ =L	A ₀ =H	B ₀ =L	S ₉ =L	S ₁ =H	S ₅ =L
S ₁ =H	A ₁ =L	B ₁ =H	S ₁₀ =H	S ₂ =H	S ₆ =H
S ₂ =H	A ₂ =L	B ₂ =L	S ₁₀ =H	S ₃ =L	S ₇ =L
S ₃ =L	A ₃ =H	B ₃ =H	S ₉ =L	S ₄ =H	S ₈ =H
M=L CN=L			S ₁₁ =L S ₁₂ =L		

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Example?

Obtain result of $\{(A-B)-1\}$ if $A=1001$ & $B=0101$

$$(A) = 1001$$

$$-B = -0101$$

$$\underline{0100}$$

$$- \quad 2$$

$$\underline{\quad \quad \quad}$$

$$0011$$

Ans