

Ex.No.08: Addition, Subtraction, Multiplication and Division using 8051

8.1 Introduction:

The purpose of this experiment is to add, subtract, multiply and divide the given two 8 bit numbers and store them in a memory location. The student should also be able to design the addition and subtraction with carry and borrow.

8.2 Hardware Requirement:

The 8051 Microcontroller kit , Power supply.

8.3 Program Logic:

To perform addition in 8051 one of the data should be in accumulator, another data can be in any of the general purpose register or in memory or immediate data. After addition the sum will be in accumulator. The sum of two 8-bit data can be either 8-bits(sum only) or 9-bits(sum and carry). The accumulator can accumulate only the sum and there is a carry the 8051 will indicate by setting carry flag. Hence one of the register is used to account for carry.

The 8051 has MUL instruction unlike many other 8-bit processors. MUL instruction multiplies the unsigned 8-bit integers in A and B. The lower order byte of the product is left in A and the higher order byte in B.

The 8051 has DIV instruction unlike many other 8-bit processors. DIV instruction divides the unsigned 8-bit integers in A and B. The accumulator receives the integer part of the quotient and the register B receives the remainder.

8.4 Procedure:

- i) Enter the opcodes from memory location 4200
- ii) Execute the program
- iii) Check for the result at 4100 and 4101

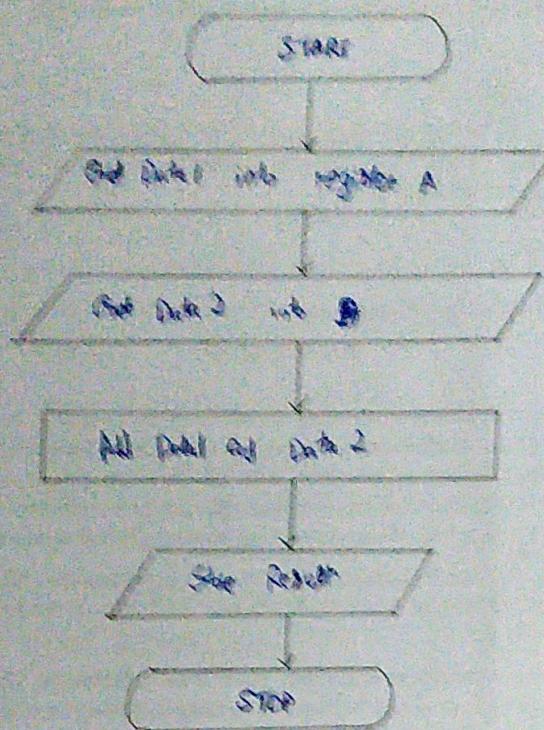
Using the accumulator, subtraction is performed and the result is stored. Immediate addressing is employed. The SUBB instruction drives the result in the accumulator.

8.5 Program

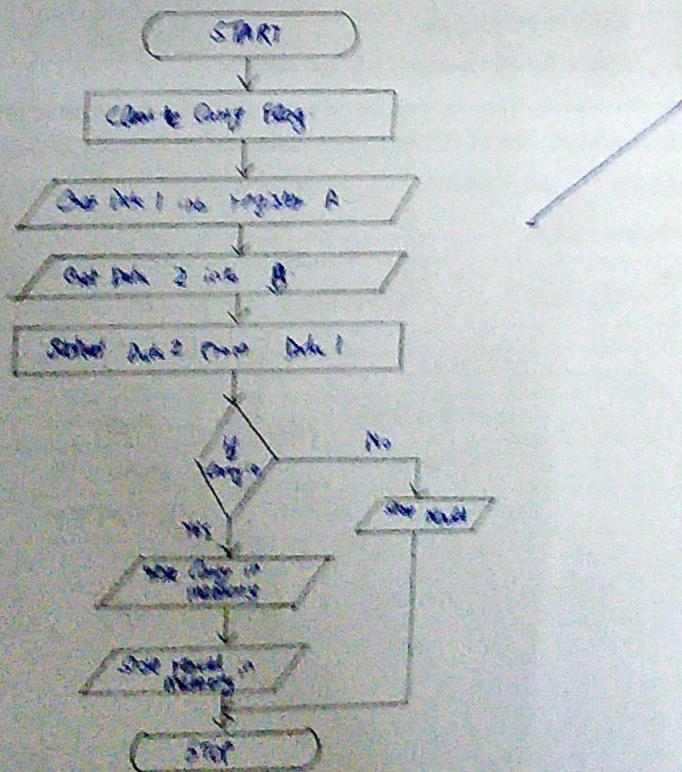
Addition without carry:

MEMORY ADDRESS	LABEL	MNEMONICS	OP CODE	COMMENTS
		CLR C		
4100		MOV A,#data1	7445	Move Dk-1 to Register A
4102		ADD A, #data2	2469	Add Dk1 and Data2
4104		MOV DPTR, #4500H	904500	Initialize DPTR to 4500H
4107		MOVX @DPTR, A	F0	Transfer data of A into DPTR
4108	LOOP	SJMP LOOP	80FE	Terminate the program

ADDITION



SUBTRACTION



Observation

INPUT		OUTPUT	
Address	Data	Address	Data
4100	45H	4500H	
4102	69H		AE

Subtraction

MEMORY ADDRESS	LABEL	MNEMONICS	OP CODE	COMMENTS
4100		CLR C	C3	Clear the carry flag
4101		MOV A,#data1	74 FE	Transfer data1 to register A
4103		SUBB A, #data2	94 69	Subtract data1 from data2
4105		MOV DPTR, #4500H	90 45 00	Initialize DPTR to 4500H
4107		MOVX @DPTR, A	F0	Transfer data2 of A to DPTR
4109	LOOP	SJMP LOOP	80 FE	Terminate the program

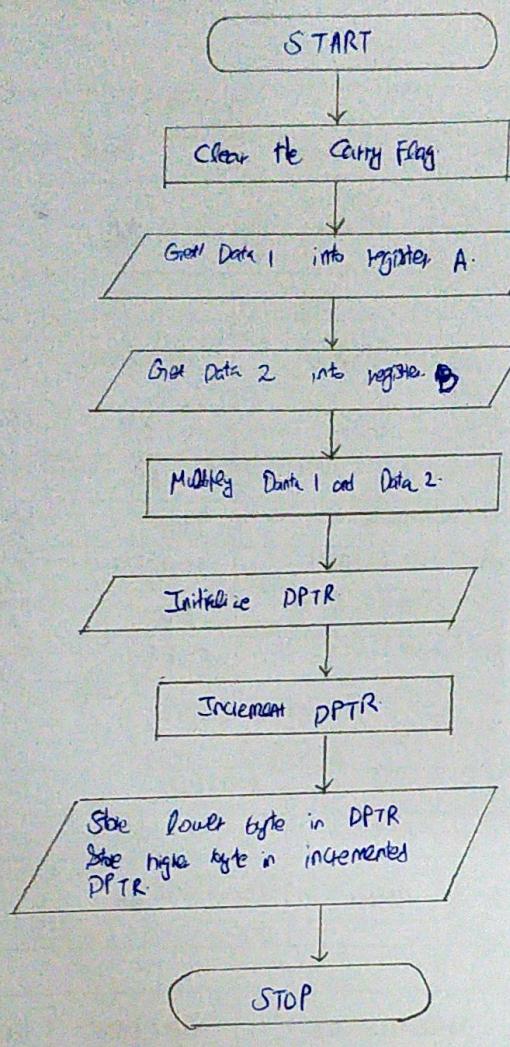
Observation

INPUT		OUTPUT	
Address	Data	Address	Data
4101	AE	4500H	
4103	69		45

Multiplication

MEMORY ADDRESS	LABEL	MNEMONICS	OP CODE	COMMENTS
		CLR C		
4100		MOV A,#data1	74 45	Transfer of data1 to register A
4102		MOV B,#data2	75 F0 69	Transfer of data2 to register B
4105		MUL AB	A4	Multiplication of A & B
4106		MOV DPTR, #4500H	90 45 00	Initialize DPTR to 4500H
4109		MOVX @DPTR, A	F0	Transfer X of A to DPTR
410A		INC DPTR	A3	Increment DPTR
410B		MOV A, B	E5 F0	Transfer of data2 to register A
410D		MOVX @DPTR, A	F0	Data in A is written to memory location DPTR

MULTIPLICATION



410E	LOOP	SJMP LOOP	80 FE	Terminate the program
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Observation

INPUT		OUTPUT	
Address	Data	Address	Data
4100	45H	4500	4D
4102	69H	4501	1C

Division

MEMORY ADDRESS	LABEL	MNEMONICS	OP CODE	COMMENTS
		CLR C		
4100		MOV A,#data1	74 3C	Transfer of Data 1 to Register A.
4102		MOV B,#data2	75 F0 0A	Transfer of Data 2 to Register B
4105		DIV AB	84	Division operation b/w A and B
4106		MOV DPTR, #4500H	90 45 00	Initialization DPTR to 4500H
4109		MOVX @DPTR, A	F0	Transfer of Data n A to DPTR
410A		INC DPTR	A3	Increment DPTR
410B		MOV A, B	E5 F0	Transfer of Data in B to Register A.
410D		MOVX @DPTR, A	F0	Transfer of Data A to incremented DPTR
410E	LOOP	SJMP LOOP	80 FE	Terminate the Program

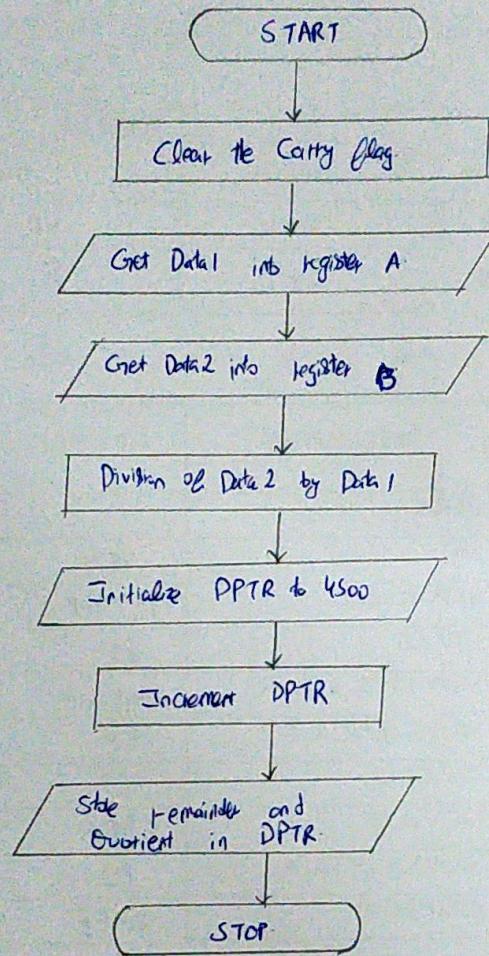
Observation

INPUT		OUTPUT	
Address	Data	Address	Data
4100	3C	4500	06
4102	0A	4501	00

8.6 Pre-Lab Questions:

1. Write the features of 8051 Microcontroller.
2. Draw the PSW format for 8051 Microcontroller
3. List out the special function registers of 8051.

DIVISION



Q3) What does it represent?

1. Shows the number of child labor cases in thousands of following countries
India & China
2. India & China
3. Between the countries, how many children labour

India

China India numbers are same of how many
cases are they in a year there are probably
more than 100 million.

Microprocessor Lab

Exp. 8 Addition, Subtraction, Multiplication and Division Using 8051

I Pre-Lab Questions

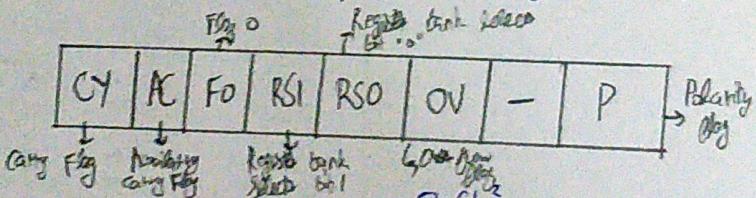
1. What are the features of 8051 Microcontroller?

- Ans:
- 4KB of on-chip program memory (ROM)
 - 128 bytes of on-chip data memory (RAM)
 - Four register banks
 - 128 user defined software flags
 - 8-bit bidirectional data bus
 - 16-bit Unidirectional address bus
 - 32 general purpose registers each of 8-bit.

2. Draw the PSW format of 8051 Microcontroller?

Ans

The program Status Word (PSW) Register is an 8-bit register, also known as Flag register. It is 8-bit wide but only 6 bits are used. The two unused bits are user defined flags. Four of the flags are called Conditional Flags. These four are CY, AC, P, OV. The bits R0, R1, R2 are used to change the bank registers.



3. List out the Special Function Registers of 8051.

Ans

(a) ACC, B, DPL, DPH, IE, IP, PD, P1, P2, P3, PCON, PSW, SCON, SBUF, SP, TMOD, TCON, TLO, THO, TL1, TH1. These are the Special Function registers of 8051.

II Post-Lab Questions

1. Show that the states of CY, AC and P flags after the execution of following instructions

Mov A, #9CH

ADD A, #64H

John
9C \rightarrow 1001 1100

64 \rightarrow 0110 0100

$$\begin{array}{r} (1) \\ 0110 \\ + 0100 \\ \hline 0011 0000 \end{array}$$

The result of the instruction execution is $(115)_{10}$, $CY=1$. Since there is a carry out from D7 bit AC=1, since there is a carry out from D3-D4 bit. $P=0$, since the number of 1's is 8, i.e (even)