8-bit arithmetic operations using 8051

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Aim: To write assembly program to do following 8-bit arithmetic operations using 8051:

• Addition

- Subtraction
- Multiplication
- Division

12 a) Addition

Exp No: 12

Program:

Program	Comments
MOV R0, #00	Transferring the data 00 to R0
MOV A, r1	Transferring the input data from r1 to A
ADD A, r2	Add the input data from r2 and A A=r2+A
JNC LABEL	Jump to LABEL if no carry
INC RO	Increment R0
LABEL: MOV r4, A	LABEL loop, transferring data from A to r4
MOV 03, R0	Transferring the data from R0 to 03
HERE: SJMP HERE	Infinite loop

Input 1:

	0	1	2	3	4	5	6	7	8	9	A	В	С	D	E	F
00	00	10	80	00	00	00	00	00	00	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Output 1:

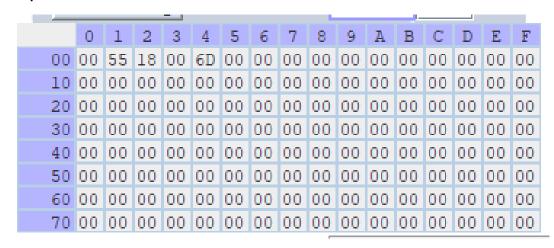
	0	1	2	3	4	5	6	7	8	9	A	В	С	D	E	F
00	00	10	08	00	18	00	00	00	00	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Explanation: 10+8=18

Input 2:

	0	1	2	3	4	5	6	7	8	9	A	В	C	D	E	F
0.0	0.0	55	18	00	00	00	00	00	00	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Output 2:



Explanation: 55+18=6d

Result:

Thus, the assembly program for 8-bit arithmetic addition is written and executed.

12 b) Subtraction

Program:

Program	Comments
MOV R0, #00	Transferring the data 00 to R0
MOV R4, #00	Transferring the data 00 to R4
MOV A, r1	Transferring the input data from r1 to A
SUBB A, r2	Subtract the input data from r2 and A A=r2-A
JNC LABEL	Jump to LABEL if no carry
INC R4	Increment R4
MOV B, R4	Transferring the data from R4 to B
MOV r4, B	Transferring the data from B to r4
LABEL: MOV r5, A	LABEL loop, transferring data from A to r5
HERE: SJMP HERE	Infinite loop

Input 1:

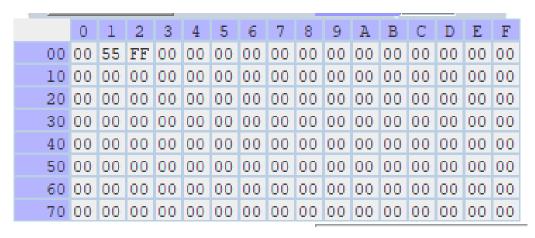
_			_			_	-	_		_	_		_	_	_	_
	0	Τ	2	3	4	5	6	7	8	9	A	В	C	D	E	E
00	00	55	18	00	00	00	00	00	00	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Output 1:

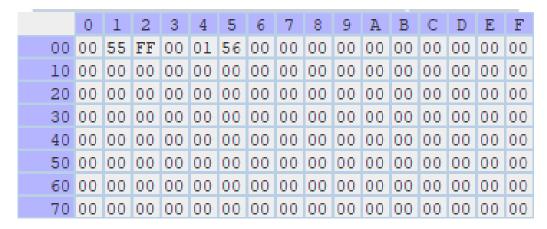
	0	1	2	3	4	5	6	7	8	9	Α	В	С	D	Ε	F
00	00	55	18	00	00	3D	00	00	00	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Explanation: 55-18=3D positive number

Input 2:



Output 2:



Explanation: 55-FF=-AA (1 indicates negative and complement of AA is 56) => 1 56

Result:

Thus, the assembly program for 8-bit arithmetic subtraction is written and executed.

12 c) Multiplication

Program:

Program	Comments
MOV R0, #00	Transferring the data 00 to R0
MOV A, r1	Transferring the input data from r1 to A
MOV B, r2	Add the input data from r2 and B
MUL AB	A x B = BA
MOV r4, B	Transferring the data from B to r4
MOV r5, A	Transferring the data from A to r5
HERE: SJMP HERE	Infinite loop

Input:

	0	1	2	3	4	5	6	7	8	9	Α	В	С	D	E	F
0.0	00	AA	ВВ	00	00	00	00	00	00	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Output:

	0	1	2	3	4	5	6	7	8	9	A	В	С	D	E	F
0.0	00	AA	ВВ	00	7C	2E	00	00	00	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Explanation: AA X BB = 7C2E

Result:

Thus, the assembly program for 8-bit arithmetic multiplication is written and executed.

12 d) Division

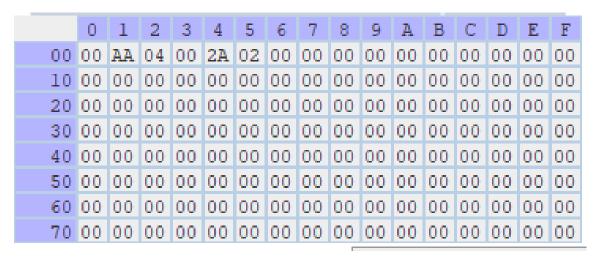
Program:

Program	Comments
MOV R0, #00	Transferring the data 00 to R0
MOV A, r1	Transferring the input data from r1 to A
MOV B, r2	Add the input data from r2 and B
DIV AB	A x B = BA
MOV r4, A	Transferring the data from A to r4
MOV r5, B	Transferring the data from B to r5
HERE: SJMP HERE	Infinite loop

Input:

	0	1	2	3	4	5	6	7	8	9	A	В	С	D	E	F
00	00	AA	04	00	00	00	00	00	00	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Output:



Explanation: AA / 04 = 2A with remainder 02

Result:

Thus, the assembly program for 8-bit arithmetic division is written and executed.