Exp No: 12 **8-bit arithmetic operations using 8051**

Date: 19/10/2020

Name: Gokhulnath T
Register Number: 185001051

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

- Addition
- Subtraction
- Multiplication
- Division

12 a) Addition

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 R0	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	B	C	D	E	F
00	00	10	08	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	B	C	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	B	C	D	E	F
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 2:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	55	18	00	6D	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: 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	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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	A	B	C	D	E	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:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	55	FF	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:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	55	FF	00	01	56	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-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	A	B	C	D	E	F
00	00	AA	BB	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	B	C	D	E	F
00	00	AA	BB	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	B	C	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:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	AA	04	00	2A	02	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 / 04 = 2A with remainder 02

Result:

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