

EE2003 ASSIGNMENT - 1

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Problem: 13

Question

Use the assembly language program (of the equivalent binary instructions) generated by a compiler for the following IF statement:

IF (A - B) 10 , 20 , 30

The program branches to statement 10 if $A - B < 0$; to statement 20 if $A - B = 0$; and to statement 30 if $A - B > 0$.

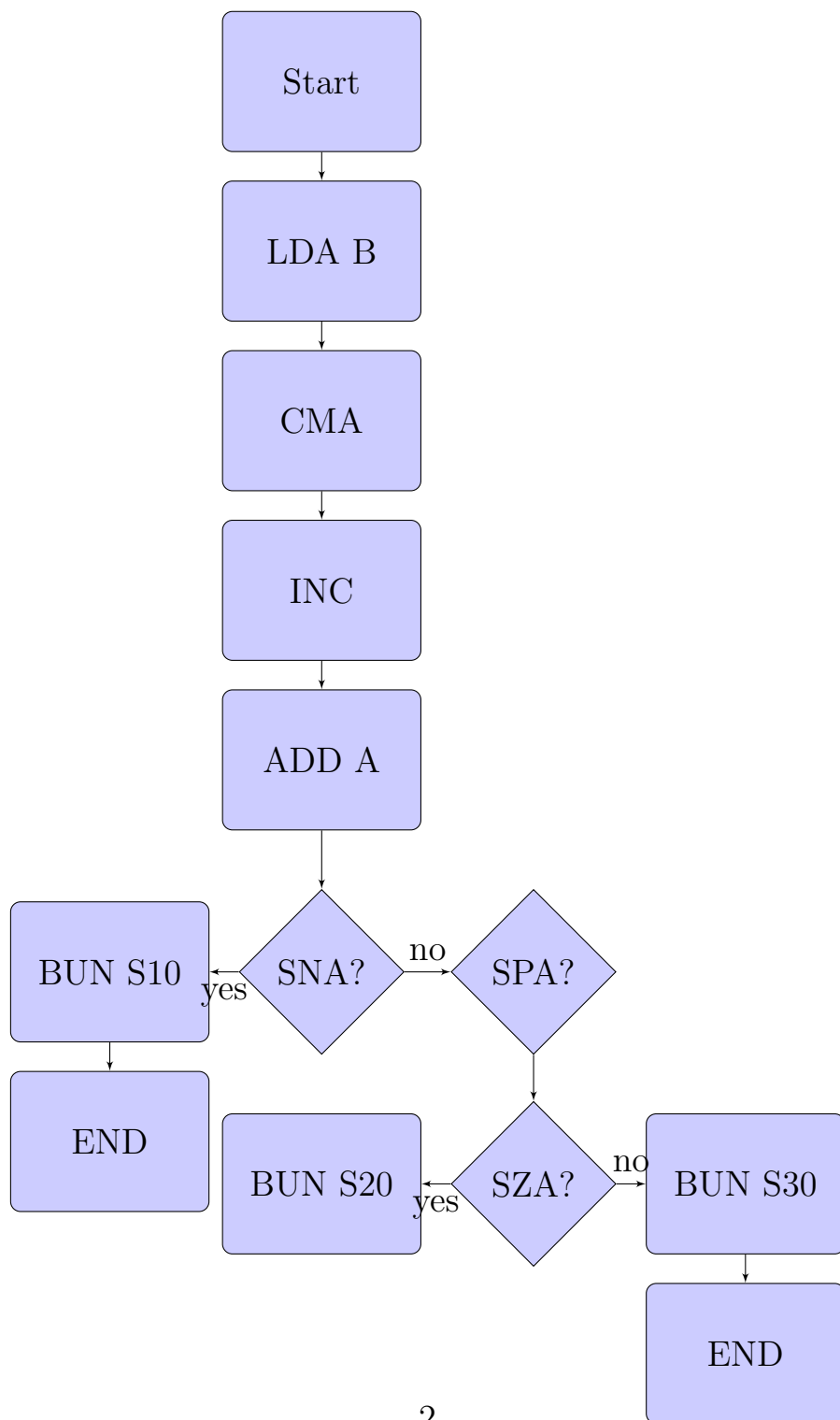
Logic Used

This program loads the value of 'B' into the accumulator, complements it, increments it by 1, and adds it to 'A'. This is equivalent to subtracting 'B' from 'A'. The program then checks if the result is negative using the 'SNA' instruction. If it is, the program branches to statement 'S10'. If the result is zero, the program branches to statement 'S20' using the 'SZA' instruction. If the result is positive, the program branches to statement 'S30'.

In statements 'S10', 'S20', and 'S30', the program loads the values of 'TEN', 'TWENTY', and 'THIRTY' into the accumulator, respectively. It then stores the value in the accumulator into the memory location specified by 'RESULT' and branches to statement 'END'.

In statement 'END', the program halts execution.

The values of 'TEN', 'TWENTY', 'THIRTY', 'A', 'B', and 'RESULT' are specified at the end of the program.



Program

```
LDA B
CMA
INC
ADD A
SNA
SPA
BUN S10
SZA
BUN S30
BUN S20
```

```
S10, LDA TEN
STA RESULT
BUN END
```

```
S20, LDA TWENTY
STA RESULT
BUN END
```

```
S30, LDA THIRTY
STA RESULT
BUN END
```

```
END, HLT
TEN, DEC 10
TWENTY, DEC 20
THIRTY, DEC 30
A, DEC 5
B, DEC 3
RESULT, HEX 0000
```

Inputs

1. **1st input:**
A, DEC 5
B, DEC 3
RESULT, HEX 0000
2. **2nd input:**
A, DEC 6
B, DEC 6
RESULT, HEX 0000
3. **3rd input:**
A, DEC 3
B, DEC 5
RESULT, HEX 0000
4. **4th input:**
A, DEC -5
B, DEC -3
RESULT, HEX 0000
5. **5th input:**
A, DEC -6
B, DEC -6
RESULT, HEX 0000
6. **6th input:**
A, DEC -3
B, DEC -5
RESULT, HEX 0000

Result

1. **1st input:**
A, DEC 5
B, DEC 3
RESULT, HEX 001E
2. **2nd input:**
A, DEC 6
B, DEC 6
RESULT, HEX 0014
3. **3rd input:**
A, DEC 3
B, DEC 5
RESULT, HEX 000A
4. **4th input:**
A, DEC -5
B, DEC -3
RESULT, HEX 000A
5. **5th input:**
A, DEC -6
B, DEC -6
RESULT, HEX 0014
6. **6th input:**
A, DEC -3
B, DEC -5
RESULT, HEX 001E

Output

END	013	HLT	7001
TEN	014	DEC 10	000A
TWENTY	015	DEC 20	0014
THIRTY	016	DEC 30	001E
A	017	DEC 5	0005
B	018	DEC 3	0003
RESULT	019		001E

Figure 1: Output 1

END	013	HLT	7001
TEN	014	DEC 10	000A
TWENTY	015	DEC 20	0014
THIRTY	016	DEC 30	001E
A	017	DEC 6	0006
B	018	DEC 6	0006
RESULT	019		0014

Figure 2: Output 2

END	013	HLT	7001
TEN	014	DEC 10	000A
TWENTY	015	DEC 20	0014
THIRTY	016	DEC 30	001E
A	017	DEC 3	0003
B	018	DEC 5	0005
RESULT	019		000A

Figure 3: Output 3

END	013	HLT	7001
TEN	014	DEC 10	000A
TWENTY	015	DEC 20	0014
THIRTY	016	DEC 30	001E
A	017	DEC -5	FFFB
B	018	DEC -3	FFFD
RESULT	019		000A

Figure 4: Output 4

END	013	HLT	7001
TEN	014	DEC 10	000A
TWENTY	015	DEC 20	0014
THIRTY	016	DEC 30	001E
A	017	DEC -6	FFFA
B	018	DEC -6	FFFA
RESULT	019		0014

Figure 5: Output 5

END	013	HLT	7001
TEN	014	DEC 10	000A
TWENTY	015	DEC 20	0014
THIRTY	016	DEC 30	001E
A	017	DEC -3	FFFD
B	018	DEC -5	FFFB
RESULT	019		001E

Figure 6: Output 6