EE2003: Computer Organisation

Indian Institute of Technology, Madras (Jul - Nov '23)

Assignment 1: Mano Simulator

Arnav Mahajan [EP21B004]

(P24) Write a program to find XNOR between MSB and LSB of a given hexadecimal number. If FF00 is the input hexadecimal number, output should be 0.

Logic Used

The given hexadecimal number (`INPUT`) is loaded (`LDA`) into `AC` and is circularly shifted using `CIL` five times (to account for the `E` bit) so that we obtain it in the LSB. It is stored into `MSB` variable.

`MSB` is XNORed with `INPUT` so that we obtain the required result at the LSB of result. `RESULT` is obtained by ANDing it with `000F`.

The XNOR operation is carried out in the following manner due to unavailability of OR gate:

```
X XNOR Y = [(X'Y')'(XY)']'
```

Program

```
CLE
LDA INPUT
CIL
CIL
CIL
CIL
CIL
STA MSB

AND INPUT
CMA
STA T
LDA MSB
CMA
STA W
LDA INPUT
CMA
AND W
CMA
AND T
CMA
AND LSB_EXTRACTOR
STA RESULT
```

```
HLT

MSB, HEX 0000
T, HEX 0000
W, HEX 0000
LSB_EXTRACTOR, HEX 000F
RESULT, HEX 0000

INPUT, HEX DF06
```

Tests

Test No.	Input	Result
1	FF00	0000
2	DF06	0004

Output

Output for Test No. 2:

RAM:

Label	Address	Instruction	Hex
	000	CLE	7400
	001	LDA INPUT	201C
	002	CIL	7040
	003	CIL	7040
	004	CIL	7040
	005	CIL	7040
	006	CIL	7040
	007	STA MSB	3017
	008	AND INPUT	001C
	009	CMA	7200
	00A	STA T	3018
	00B	LDA MSB	2017
	00C	CMA	7200
	00D	STA W	3019
	00E	LDA INPUT	201C
	00F	CMA	7200
	010	AND W	0019
	011	CMA	7200
	012	AND T	0018
	013	CMA	7200
	014	AND LSB_EXTRACT...	001A
	015	STA RESULT	301B
	016	HLT	7001

RAM:

Label	Address	Instruction	Hex
MSB	017		E0CD
T	018		3FFB
W	019		1F32
LSB_EXTRACTOR	01A	HEX 000F	000F
RESULT	01B		0004
INPUT	01C	HEX DF06	DF06