

Normal nano processor

Inputs

Buttons

- Reset (reset register bank and PC)– btnC

(it takes a time of clock cycle to reset and button should be pressed until that.)

Clock signal

- Clk

Outputs

Leds

- Op_Led (Display the output of register7) -Led0-Led3
- Over_Flow (Display overflowing results) -Led 14
- Zero (Display zero result of 4bit adder and overflow) -Led 15

7 segment display

- Sev_7Seg - seg0-seg6
- anode(switch on rightmost 7-segment) - an0-an3

Program

101110000001 - MOV 1 TO REG 7

(Seven segment OP – 1)

100010000010 - MOV 2 TO REG 1

001110010000 - ADD REG 7 VALUE AND REG 1 VALUE

(Seven segment OP – 3)

011110000000 - NEGATION OF REG 7

(Seven segment OP – d)

101110000011 - MOV 3 TO REG 7

(Seven segment OP – 3)

010010000000 - NEGATE REG 1 VALUE

001110010000 - ADD REG 7 VALUE AND REG 1 VALUE

(Seven segment OP – 1)

110000000100 - JUMP TO LINE 4 IF REG 0 VALUE IS 0

Improved nano Processor

Special Instructions

- As a improvement we added some extra instructions (subtract and compare).

Instruction	Description	Format
ADD Ra ,Rb	Add values in registers Ra and Rb and store the result in Ra, i.e., $Ra \leftarrow Ra + Rb$	0 0 0 Ra Ra Ra Rb Rb Rb 0 0 0 0
NEG R	2's complement of registers R, i.e., $R \leftarrow -R$	0 0 1 R R R 0 0 0 0 0 0 0
MOVI R, d	Move immediate value d to register R, i.e., $R \leftarrow d$	0 1 0 R R R 0 0 0 d d d d
JZR R, d	Jump if value in register R is 0, i.e., If $R == 0$ PC $\leftarrow d$; Else PC $\leftarrow PC + 1$;	0 1 1 R R R 0 0 0 0 d d d
SUB Rb - Ra	Subtract values in registers Ra and Rb and store the result in Ra, i.e., $Ra \leftarrow Rb - Ra$	1 0 0 Ra Ra Ra Rb Rb Rb 0 0 0 0
COMP Ra ,Rb	Compare Ra value and Rb value	1 1 0 Ra Ra Ra Rb Rb Rb 0 0 0 0

Inputs

Buttons

- Reset – btnC

Clock signal

- Clk

Outputs

Leds

- Op_Led -Led0-Led3
- Over_Flow -Led 14
- Zero -Led 15
- Equal (display the equality of 2 compared numbers) -Led7
- Max_A(if A>B) - Led 6
- Max_B (if B>A) -Led 8

7 segment display

- Sev_7Seg -seg0-seg6
- anode - an0-an3

Program

0101110000001 - MOV 1 TO REG 7

(Seven segment OP – 1)

0100110000010 - MOV 2 TO REG 6

0001110110000 - ADD REG 7 VALUE AND REG 6 VALUE

(Seven segment OP – 3)

0011110000000 - GET NEG OF REG 7 VALUE

(Seven segment OP – d)

0101110000001 - MOV 1 TO REG 7

(Seven segment OP – 1)

1001110010000 - SUBTRACT REG 7 VALUE FROM REG 1 VALUE

(Seven segment OP – 1)

1101110010000 - COMPARE VALUES OF REG7 AND REG 1
(LED 8 on)

0110000000100 - jump to 5th instruction