

For testing the functionality of the processor, a program is designed to find the minimum of an array with length of 10.

The assembly code is presented in figure 2. Machine code is also presented in figure 3. These are the instructions written in memory.

```
0  C=11 add    R1,R0,1000
1  C=11 add    R2,R0,0
2  C=11 load   R3,R1(0)
3  C=11 add    R7,R0,0
4      add    R4,R0,10
5      cmp    --,R2,R4
6  C=00 B      8
7      load   R5,R1(0)
8      cmp    --,R5,R3
9  C=01 B      2
10     add    R3,R5,R0
11     add    R7,R2,R0
12     add    R1,R1,1
13     add    R2,R2,1
14     B      -10
15     store  R3,R0(2000)
16     store  R7,R0(2004)
```

Figure 2: Assembly Code

```
11000000100000000001001111101000
11000000100000000001000000000000
1101000000000000010011000000000000
1100000010000000001110000000000000
110000001000000001000000000001010
1100000001100010000000000000000100
001010000000000000000000000001000
1101000000000000101010000000000000
110000000110010100000000000000011
011010000000000000000000000000010
1100000000000001010011000000000000
1100000000000001001110000000000000
110000001000000100010000000000001
110000001000000100010000000000001
1110101111111111111111111110110
11010000000100000011011111010000
11010000000100000111011111010100
```

Figure 3: Machine Code

The array we use as the input to the program is as follows.

arr=[10,8,7,6,3,9,5,4,1,12]

Starting address of the array is 1000.

The minimum element in the array is stored in address of 2000 of the memory. In addition the index of the this element is saved in address 2004 of the memory.

The result can be observed in figure 4, presented in shape of waveform.

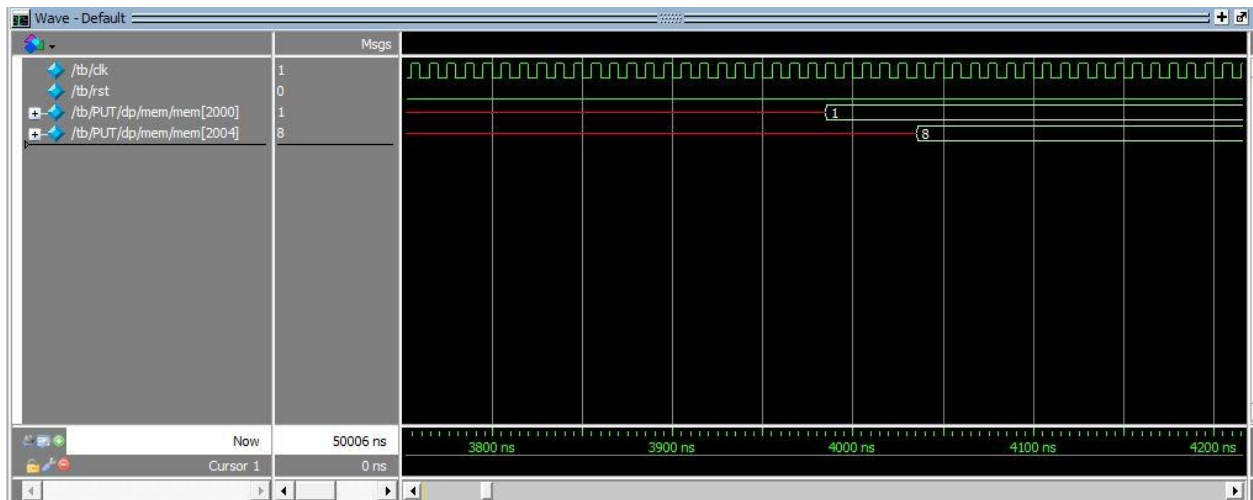


Figure 4: The Output Waveform.

As it can be observed in figure 4, the minimum element has been detected and wirtten in address 2000 of the memory (1) and the index of this element has been saved in address of 2004 of the memory (8).

- Modules used in datapath are in ***DP_Modules.v***
- Modules used in controller are in ***CU_Modules.v***
- Datapath is wired in ***Datapath.v***
- Controller unit is wired in ***Controller.v***
- The Processor is wired in ***Processor.v***