

Bahria University,

Karachi Campus



LAB EXPERIMENT NO.

02

LIST OF TASKS

TASK NO	OBJECTIVE
1	Take any integer as input, if the number is greater than 5 print it If $a > 5$, print a ; Else if $a = 0$, then Halt ; Else if $a < 5$, then Halt.
2	Take two numbers as input and print the larger number.
3	Take input from user if A is greater than 5 then print A else terminate the program.
4	Take two numbers input if $a > b$ then add i.e. $c = a + b$, else subtract i.e. $c = a - b$.
5	Input a number if A is greater than 5 then $C = A - 5$ otherwise end the program.

Submitted On:
Date: 12/10/2022

[Lab no : 2]**[Computer Architecture and Logic Design]**

Task No. 1: Take any integer as input, if $a > 5$, print a ; Else if $a = 0$, then Halt ; Else if $a < 5$, then Halt.

Solution:

```
IN
STO 98
SUB 99
BRZ 08
BRP 06
HLT
LDA 98
out
HLT
*99
DAT 005
```

Output:

The screenshot displays a simulation interface with several panels:

- Address Map:** A list of memory addresses and their contents: 00: IN, 01: STO 98, 02: SUB 99, 03: BRZ 08, 04: BRP 06, 05: HLT, 06: LDA 98, 07: out, 08: HLT, *99, 99: DAT 005.
- Program:** A section with buttons for 'Validate', 'Load', 'Help', and 'Exit'. A checkbox 'Zero Out Memory Before Load' is checked.
- I/O Log:** A log window showing the execution steps: [00] Begin Run, [00] Input: 6, [07] Output: 6, [08] End - Normal.
- Execute:** A control panel with buttons for 'Run', 'Step', 'Pause', 'Restart', and 'Return'. It also includes a speed slider and checkboxes for 'Show Source Window' and 'Tick'.
- Hardware View:** A detailed view of the processor and RAM. The processor section shows the Accumulator (006), Program Counter (08), and Instruction Register (HLT). The RAM section shows a memory table with addresses 0_ to 9_ and their corresponding values.

Task No. 2: Take two numbers as input and print the larger number

Solution:

```
IN
STO 98
IN
STO 99
SUB 98
BRP 09
LDA 98
```

[Lab no : 2]

[Computer Architecture and Logic Design]

```
OUT
HLT
LDA 99
OUT
HLT
```

Output:

The screenshot displays a simulation interface with several panels:

- Address Map:** A list of memory addresses and their contents. Address 00 contains 'IN', 01 contains 'STO 98', 02 contains 'IN', 03 contains 'STO 99', 04 contains 'SUB 98', 05 contains 'BRP 09', 06 contains 'LDA 98', 07 contains 'OUT', 08 contains 'HLT', 09 contains 'LDA 99', 10 contains 'OUT', and 11 contains 'HLT'.
- Program:** A section with buttons for 'Validate', 'Load', 'Execute', 'Run', 'Step', 'Pause', 'Restart', 'Help', and 'Return'. It also includes a 'Zero Out Memory Before Load' checkbox and a 'Tick' checkbox.
- I/O Log:** A log showing the sequence of events: [00] Begin Run, [00] Input: 10, [02] Input: 5, [07] Output: 10, and [08] End - Normal.
- Hardware View:** A diagram of the processor and RAM. The processor shows the Accumulator (Accum.) with value 010, the Program Counter (Prog. Ctr.) with value 08, and the Instruction Register (Inst. Reg.) with value HLT. The RAM is shown as a grid of 10 rows and 10 columns, with the first row containing values 901, 398, 901, 399, 298, 809, 598, 902, 000, 599.

Task No 03: Take input from user if A is greater than 5 then print A else terminate the program.

Solution:

```
IN
STO 98
SUB 97
BRP 05
HLT
LDA 98
OUT
HLT
*97
DAT 005
```

Output:

The screenshot displays a simulation interface with several components:

- Address Map:** A table showing memory addresses and their contents.

Address	Content
00	IN
01	STO 98
02	SUB 97
03	BRP 05
04	HLT
05	LDA 98
06	OUT
07	HLT
97	DAT 005
- Program:** A section with buttons for 'Validate', 'Load', 'Help', and 'Exit'. It also includes a checkbox for 'Zero Out Memory Before Load'.
- I/O Log:** A log window showing the execution sequence:


```

      [00] Begin Run
      [00] Input: 6
      [06] Output: 6
      [07] End - Normal
      
```
- Hardware View:** A window showing the internal state of the processor and RAM.
 - PROCESSOR:**
 - Accum: 006
 - Prog. Ctr: 07
 - Inst. Reg: 00
 - Instruction Cycle: 7
 - Instruction: HLT
 - RAM:** A table showing memory contents.

Address	Content
0	901 398 297 805 000 598 902 000 000 000
1	000 000 000 000 000 000 000 000 000 000
2	000 000 000 000 000 000 000 000 000 000
3	000 000 000 000 000 000 000 000 000 000
4	000 000 000 000 000 000 000 000 000 000
5	000 000 000 000 000 000 000 000 000 000
6	000 000 000 000 000 000 000 000 000 000
7	000 000 000 000 000 000 000 000 000 000
8	000 000 000 000 000 000 000 000 000 000
9	000 000 000 000 000 000 005 006 000 000

Task No 04: Take two numbers input if $a > b$ then add i.e. $c = a + b$, else subtract i.e. $c = a - b$.

Solution:

```

IN
STO 97
IN
STO 98
LDA 97
SUB 98
BRP 10
STO 99
OUT
HLT
LDA 97
ADD 98
STO 99
OUT
HLT
  
```

Output:

[Lab no : 2]

[Computer Architecture and Logic Design]

The screenshot shows a simulation interface with the following components:

- Address Map:** A list of memory addresses and their contents.

Address	Content
00	IN
01	STO 97
02	IN
03	STO 98
04	LDA 97
05	SUB 98
06	BRP 10
07	STO 99
08	OUT
09	HLT
10	LDA 97
11	ADD 98
12	STO 99
- Program:** A text area containing assembly code.


```

      IN
      STO 97
      IN
      STO 98
      LDA 97
      SUB 98
      BRP 10
      STO 99
      OUT
      HLT
      LDA 97
      ADD 98
      STO 99
      OUT
      HLT
      
```
- I/O Log:** A window showing the execution log.


```

      [00] Begin Run
      [00] Input: 10
      [02] Input: 20
      [08] Output: -10
      [09] End - Normal
      
```
- Hardware View:** A window showing the internal state of the processor and RAM.
 - PROCESSOR:**
 - Accum: -010
 - Instr. Reg: 0 00
 - Prog. Ctr: 09
 - HLT: HLT
 - RAM:** A table showing memory contents.

	0	1	2	3	4	5	6	7	8	9
0	901	397	901	398	597	298	810	399	902	000
1	597	198	399	902	000	000	000	000	000	000
2	000	000	000	000	000	000	000	000	000	000
3	000	000	000	000	000	000	000	000	000	000
4	000	000	000	000	000	000	000	000	000	000
5	000	000	000	000	000	000	000	000	000	000
6	000	000	000	000	000	000	000	000	000	000
7	000	000	000	000	000	000	000	000	000	000
8	000	000	000	000	000	000	000	000	000	000
9	000	000	000	000	000	000	010	020	010	000

Task No 05: Input a number if A is greater than 5 then C = A - 5 otherwise end the program.

Solution:

```

IN
STO 97
SUB 98
BRP 05
HLT
STO 99
OUT
HLT
*98
DAT 005

```

Output:

The screenshot shows the simulation interface after executing the program for Task No 05. The components are:

- Address Map:**

Address	Content
00	IN
01	STO 97
02	SUB 98
03	BRP 05
04	HLT
05	STO 99
06	OUT
07	HLT
98	*98
99	DAT 005
- Program:**

```

      IN
      STO 97
      SUB 98
      BRP 05
      HLT
      STO 99
      OUT
      HLT
      *98
      DAT 005
      
```
- I/O Log:**

```

      [00] Begin Run
      [00] Input: 6
      [06] Output: 1
      [07] End - Normal
      
```
- Hardware View:**
 - PROCESSOR:**
 - Accum: 001
 - Instr. Reg: 0 00
 - Prog. Ctr: 07
 - HLT: HLT
 - RAM:**

	0	1	2	3	4	5	6	7	8	9
0	901	397	298	805	000	399	902	000	000	000
1	000	000	000	000	000	000	000	000	000	000
2	000	000	000	000	000	000	000	000	000	000
3	000	000	000	000	000	000	000	000	000	000
4	000	000	000	000	000	000	000	000	000	000
5	000	000	000	000	000	000	000	000	000	000
6	000	000	000	000	000	000	000	000	000	000
7	000	000	000	000	000	000	000	000	000	000
8	000	000	000	000	000	000	000	000	000	000
9	000	000	000	000	000	000	000	006	005	001

