

# Relationship between Computer Architecture and Electrical Engineering

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CSE, RUET

## Program to Physics

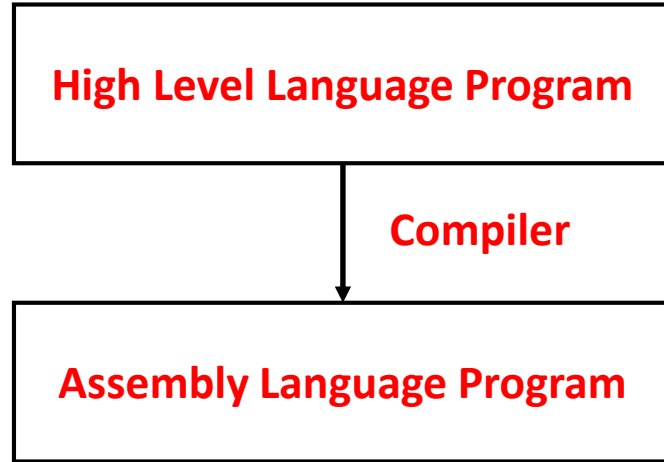
প্রশ্নঃ একটা program কিভাবে Computer  
এর Processorএ run হয়?

# উত্তরঃ Connection between High Level Language Program and Physics

High Level Language Program

```
int main(){int a=10; a=a+5; return 0;}
```

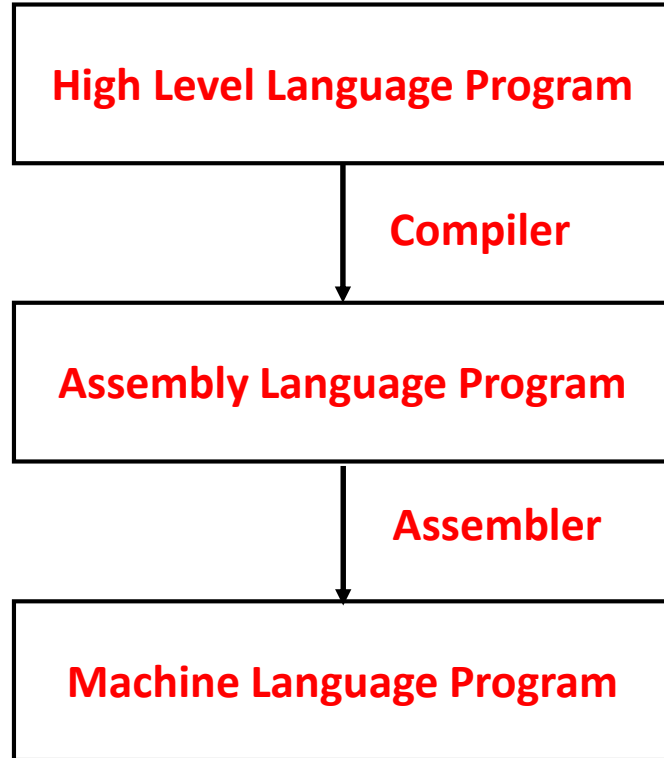
# উত্তর: Connection between High Level Language Program and Physics



```
int main(){int a=10; a=a+5; return 0;}
```

```
mov DWORD PTR [rbp-4], 10  
add DWORD PTR [rbp-4], 5
```

# উত্তর: Connection between High Level Language Program and Physics

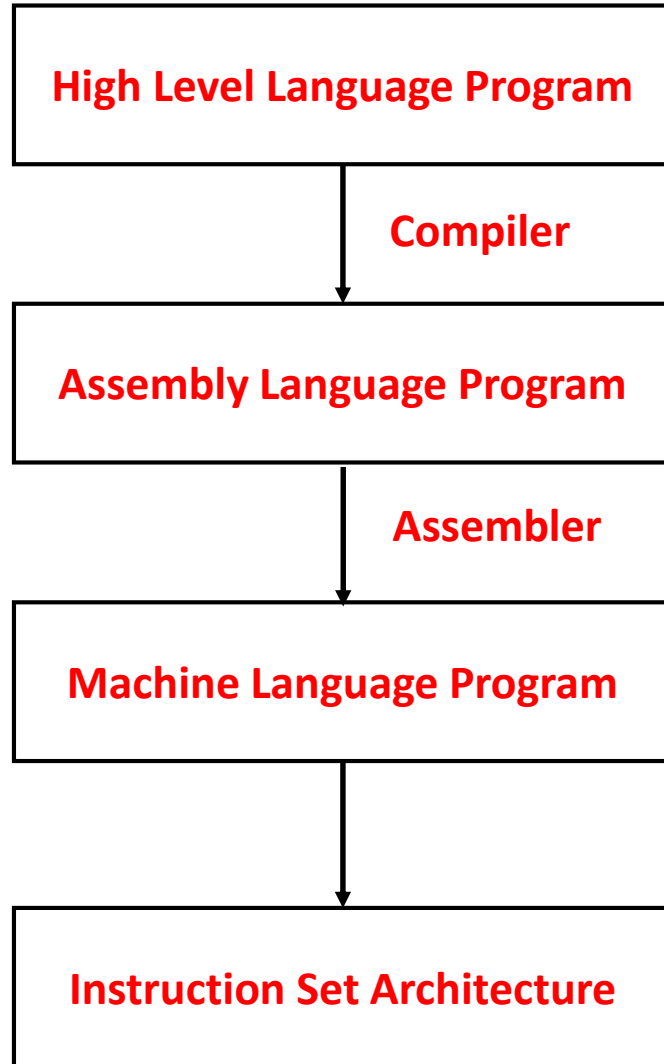


```
int main(){int a=10; a=a+5; return 0;}
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mov DWORD PTR [rbp-4], 10  
add DWORD PTR [rbp-4], 5
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```
c7 45 fc 0a 00 00 00  
83 45 fc 05
```

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```
int main(){int a=10; a=a+5; return 0;}
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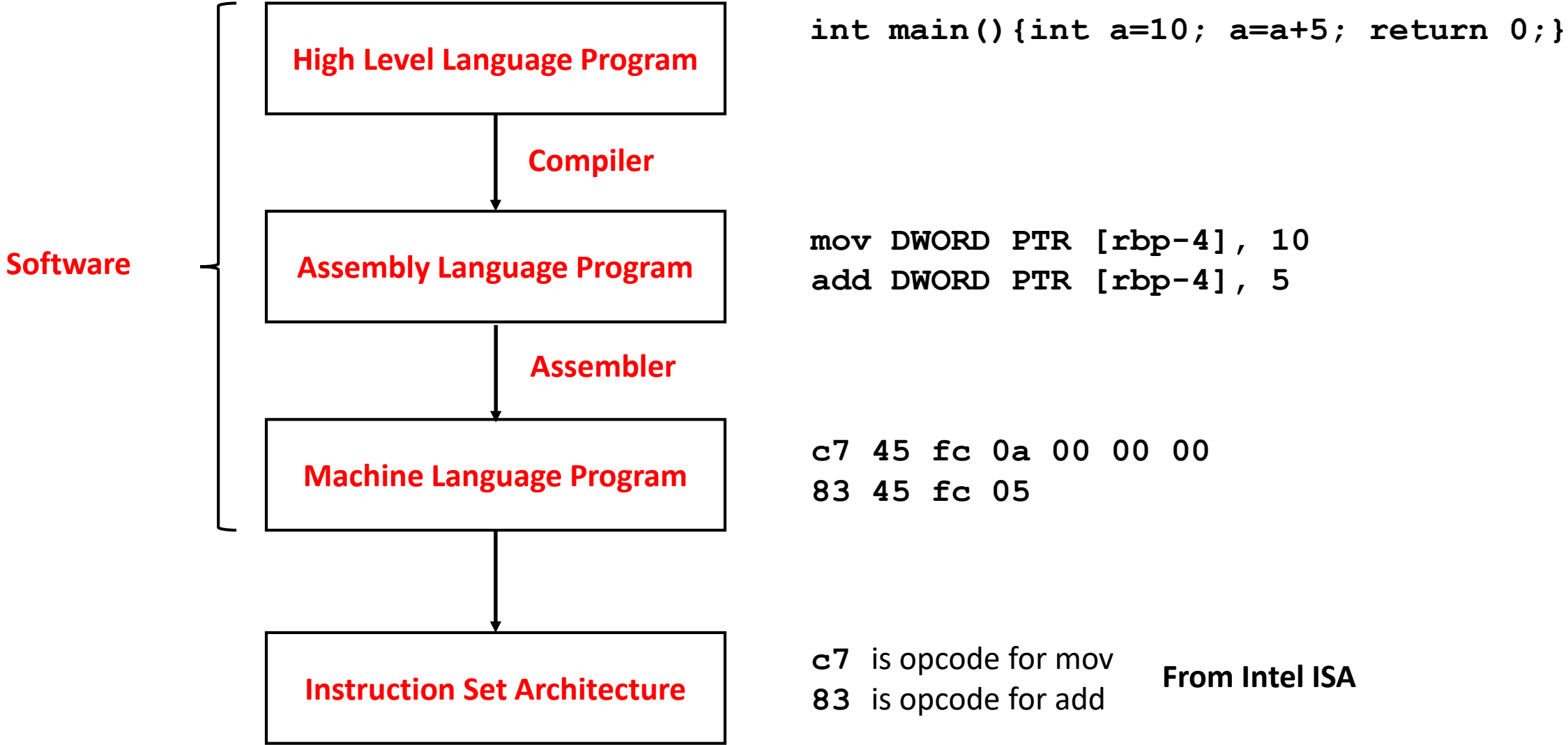
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mov DWORD PTR [rbp-4], 10  
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```
c7 45 fc 0a 00 00 00  
83 45 fc 05
```

c7 is opcode for mov  
83 is opcode for add

**From Intel ISA**

# উত্তরঃ Connection between High Level Language Program and Physics

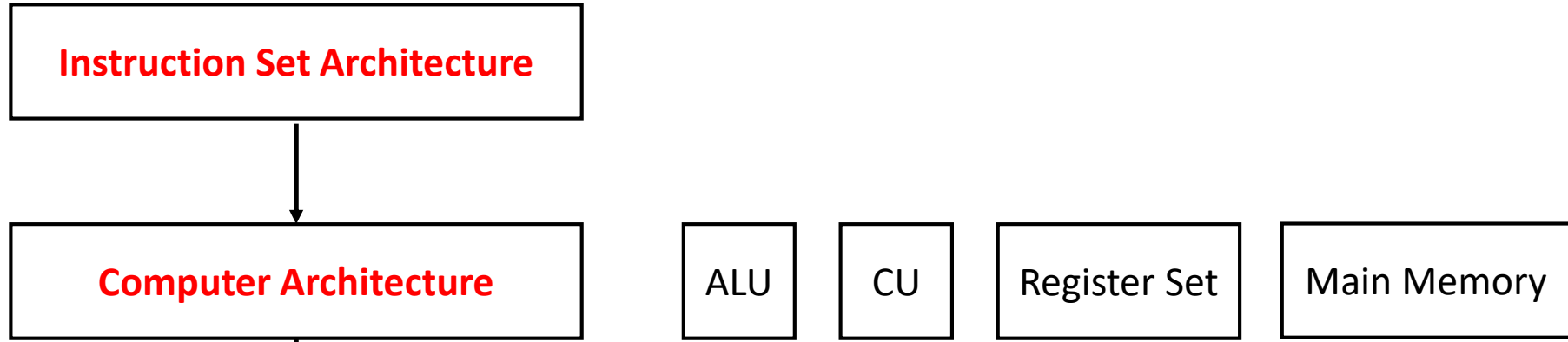


# উত্তরঃ Connection between High Level Language Program and Physics

**Instruction Set Architecture**



# উত্তরঃ Connection between High Level Language Program and Physics



# Computer Architecture (1-bit CPU)

## Program Counter (PC)

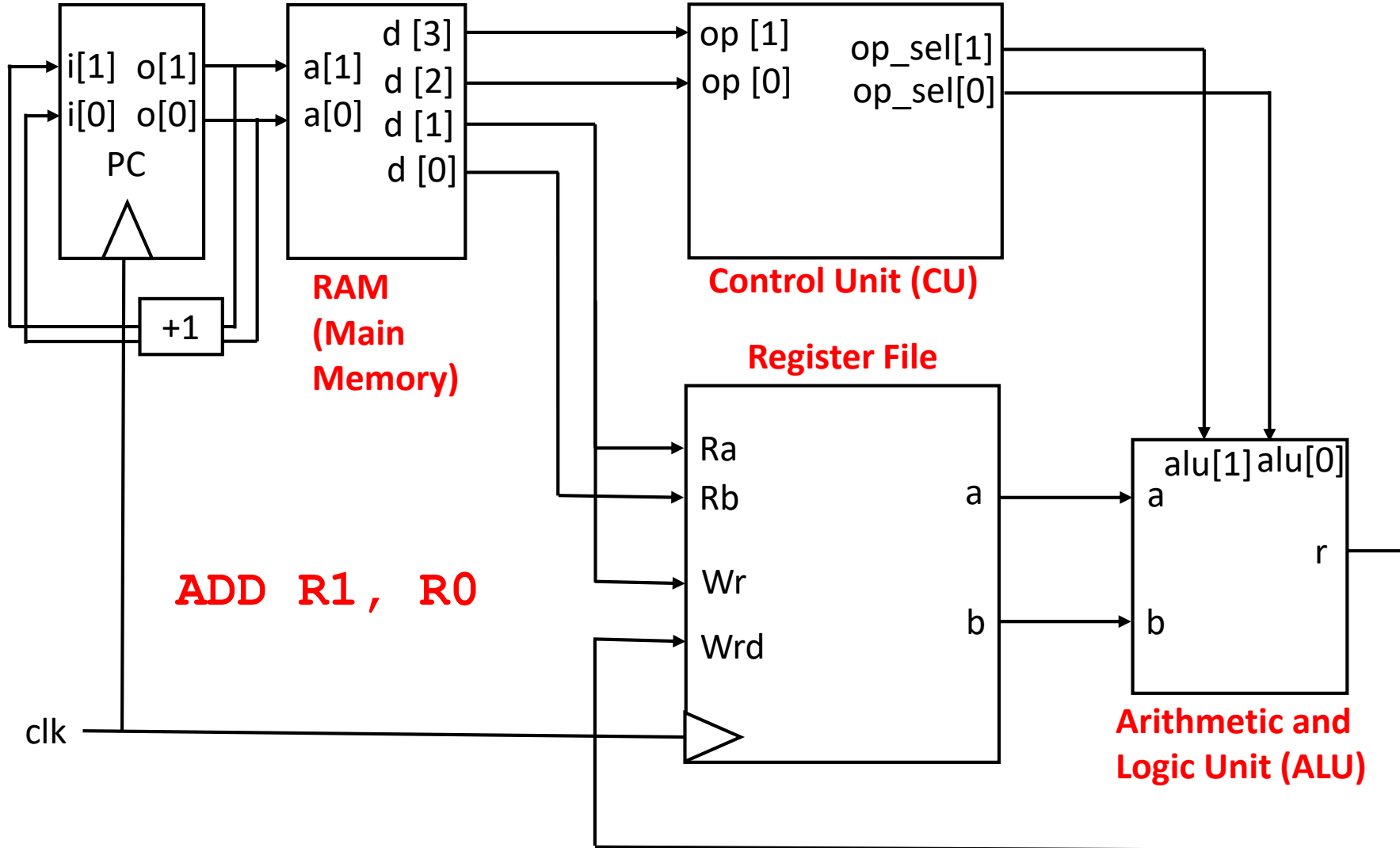


Figure: 1-bit CPU

1. Program Counter will have address of next instruction to be executed in current clock cycle.
2. Address in PC will be sent to RAM to retrieve instruction.
3. Instruction will be decoded by control unit and will select registers and/or immediate values.
4. Data within registers and/or immediate values will be sent to Arithmetic and Logic Unit (ALU) to perform operations.
5. ALU will perform operation and result will be sent to the register to be written.
6. Finally, PC will be incremented to point to the next instruction in next clock cycle.

# Computer Architecture (1-bit CPU)

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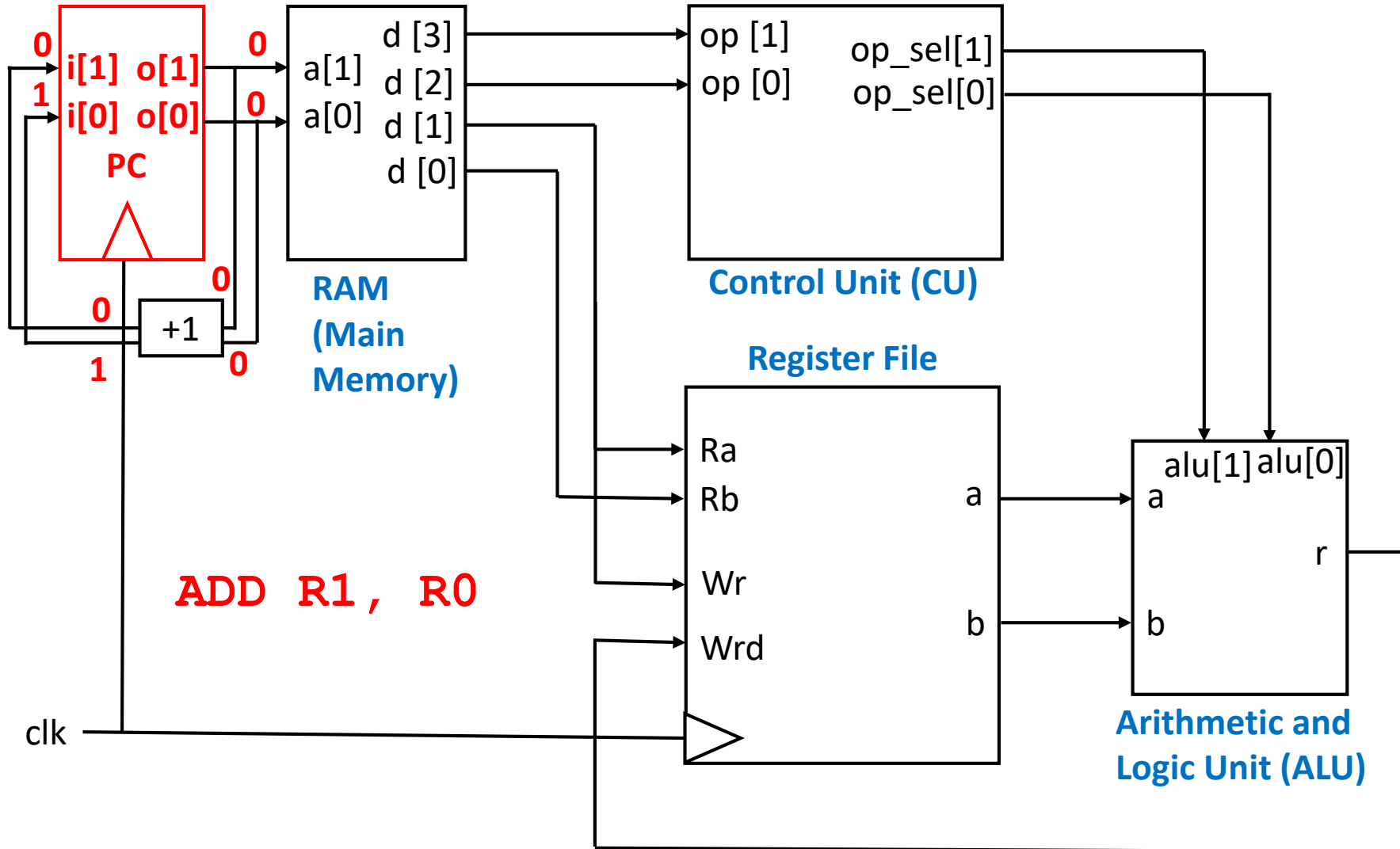


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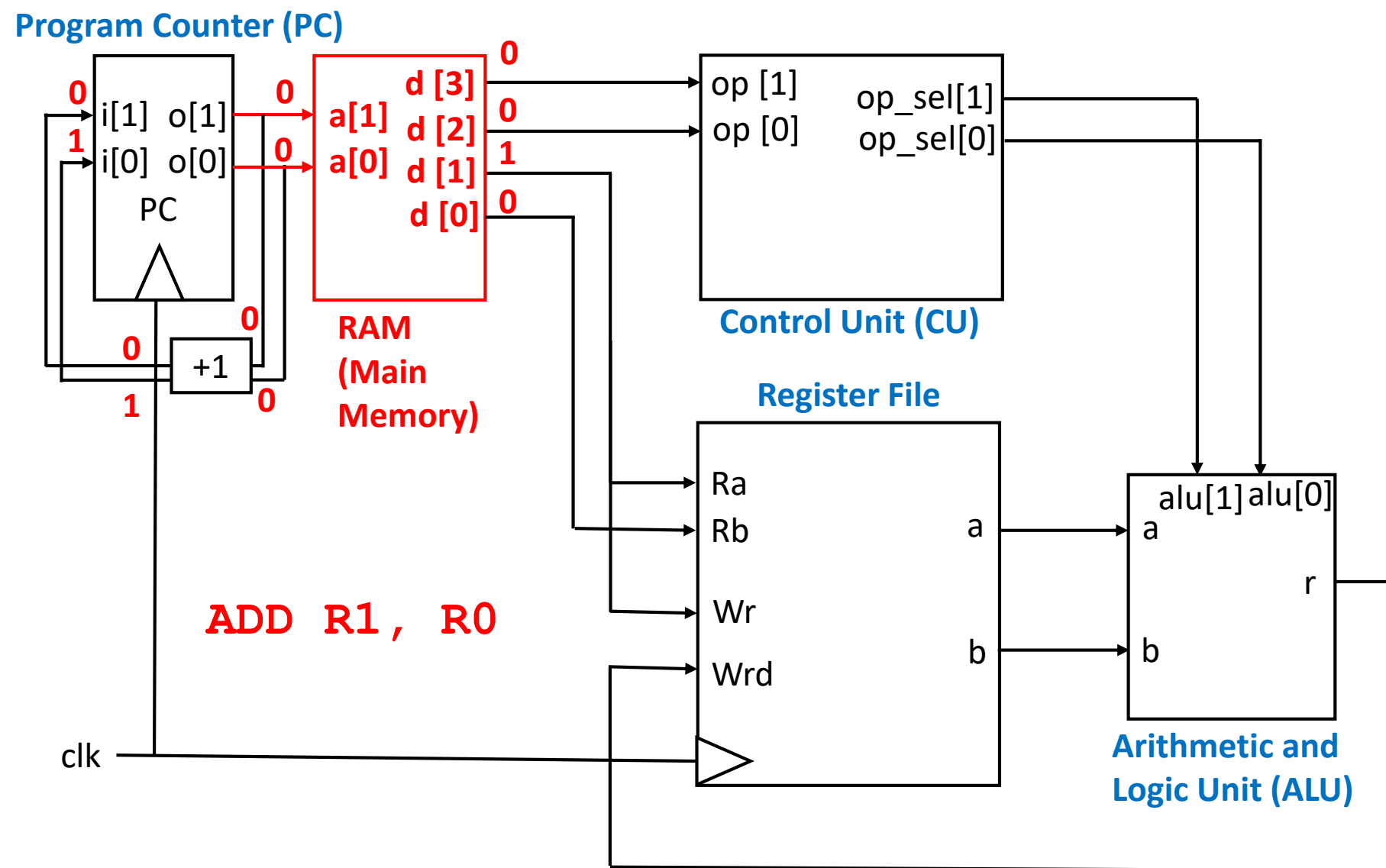
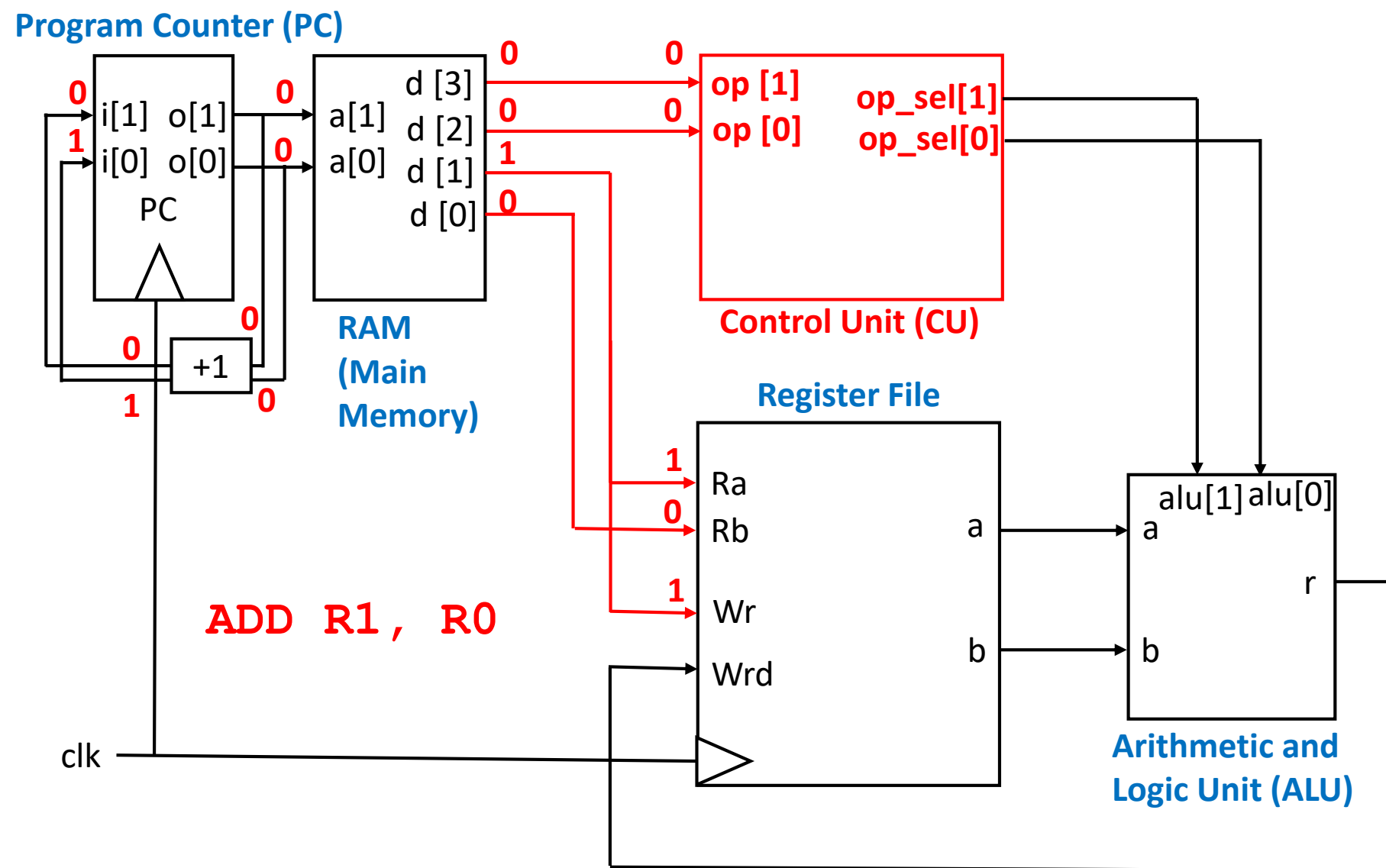


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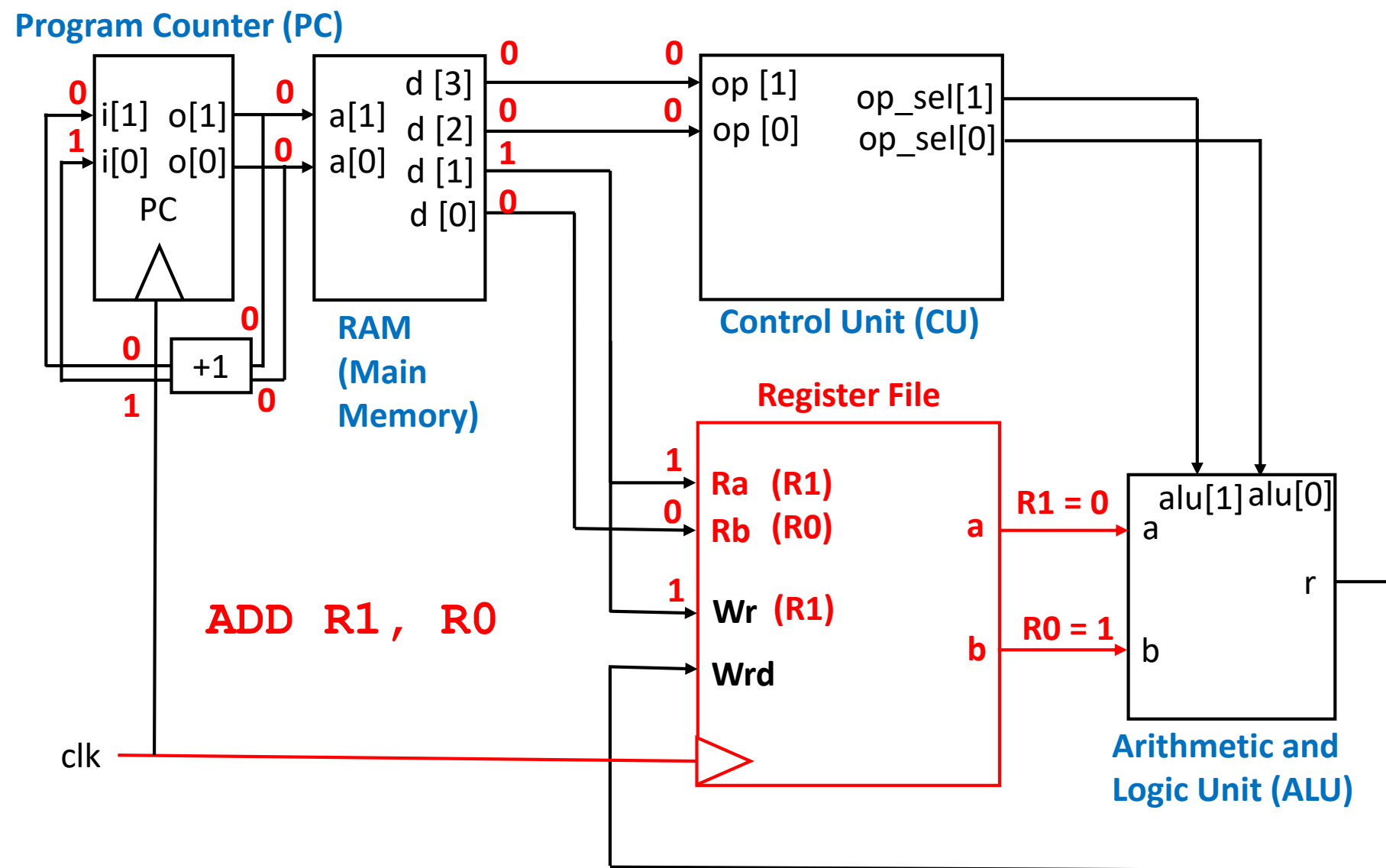


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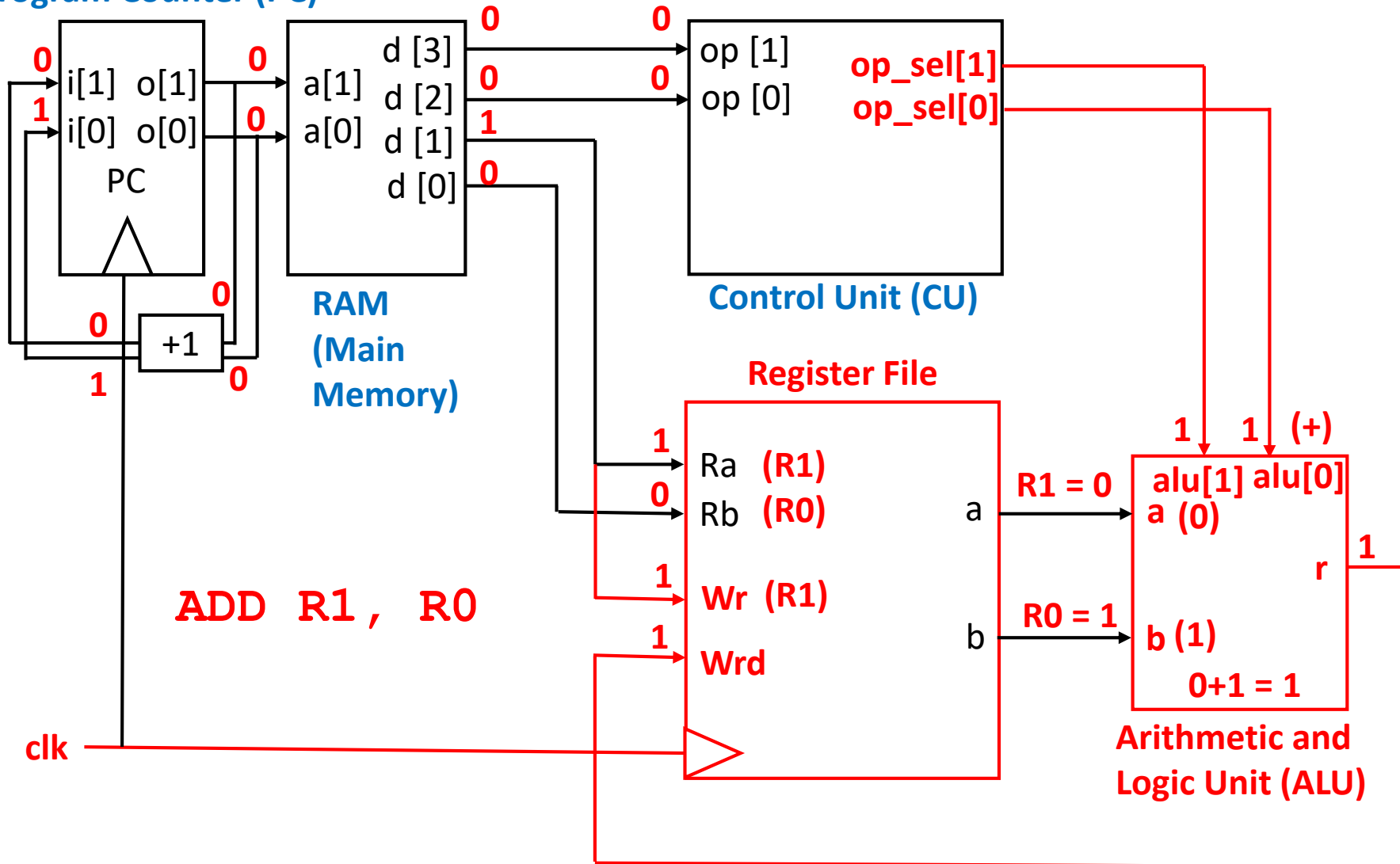


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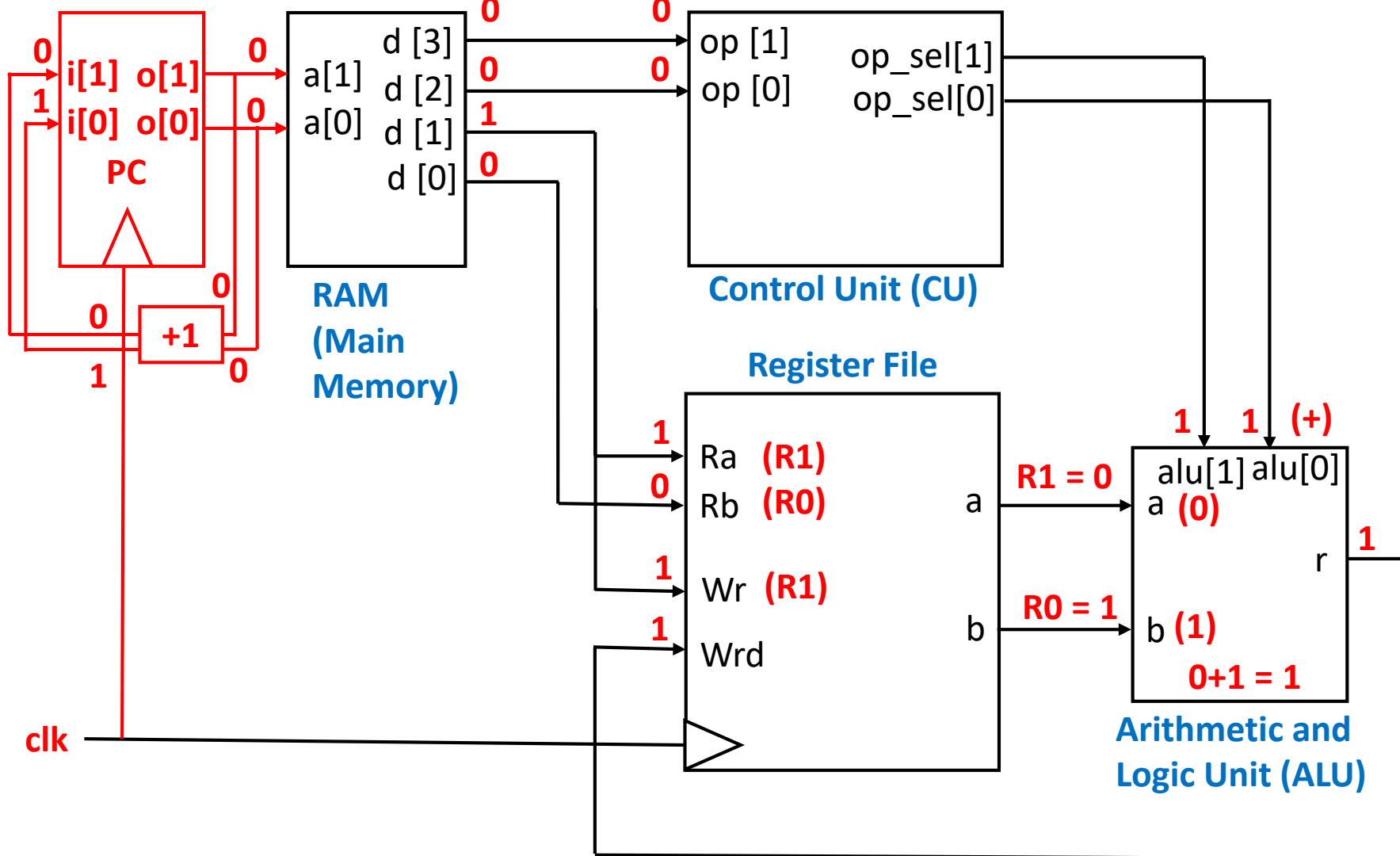
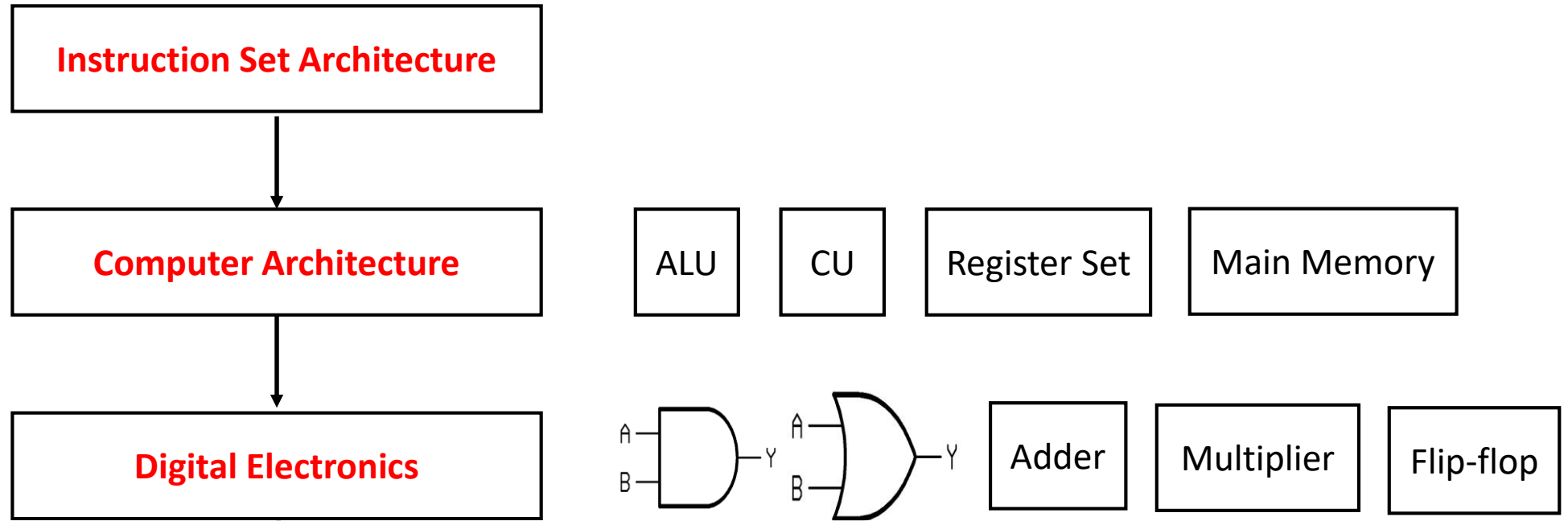


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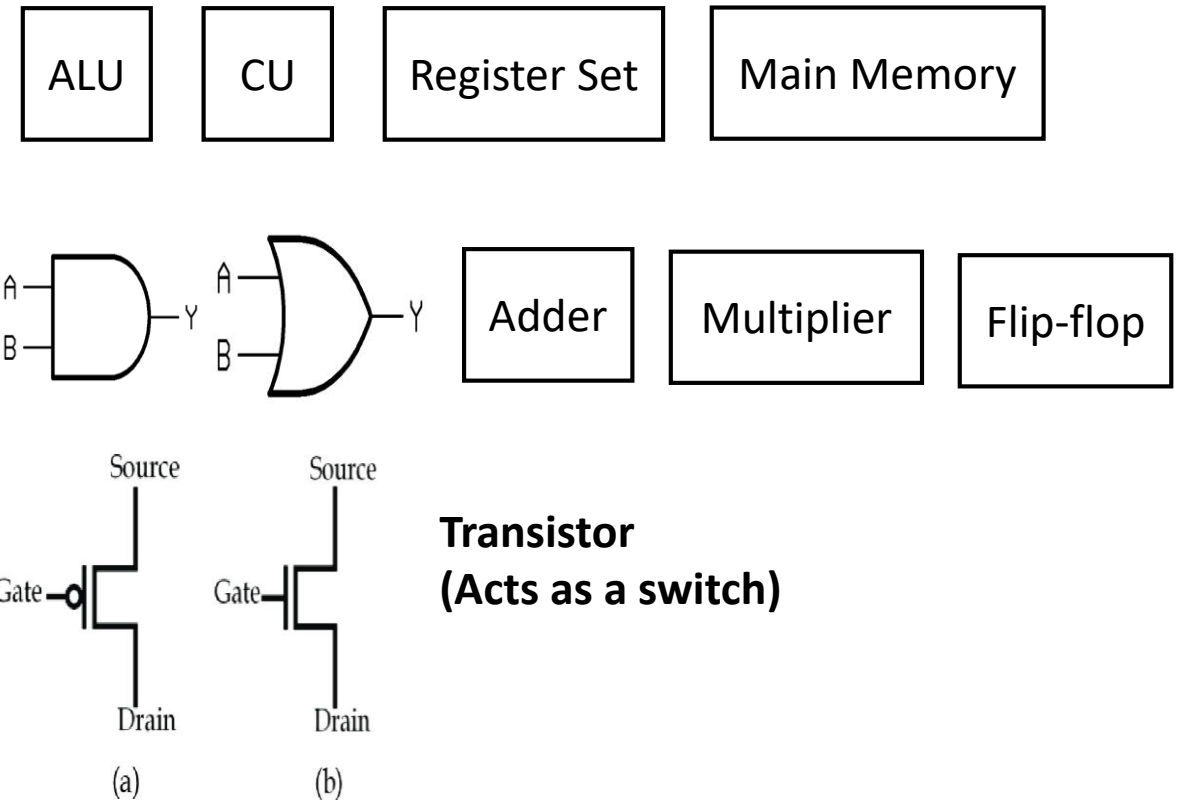
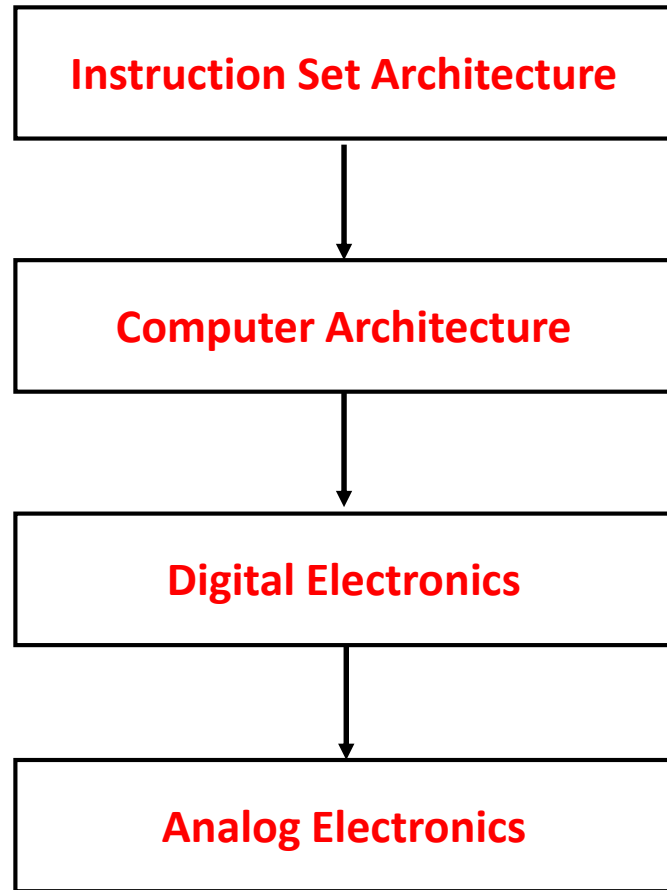
# উওৰঃ Connection between High Level Language Program and Physics



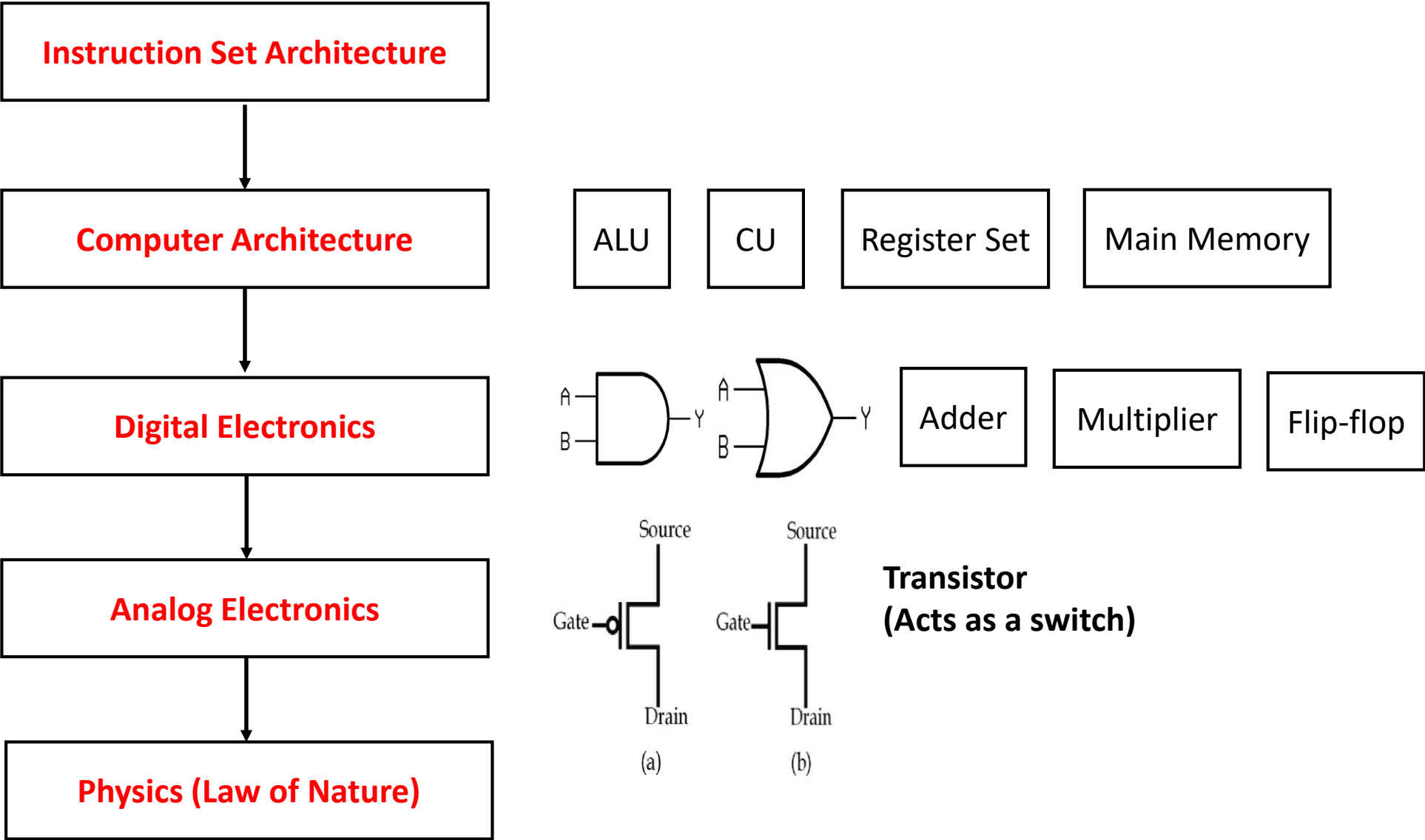
প্রশ্ন: AND gate/OR gate কি দিয়ে তৈরি?

উত্তর: **Transistor** দিয়ে তৈরি।

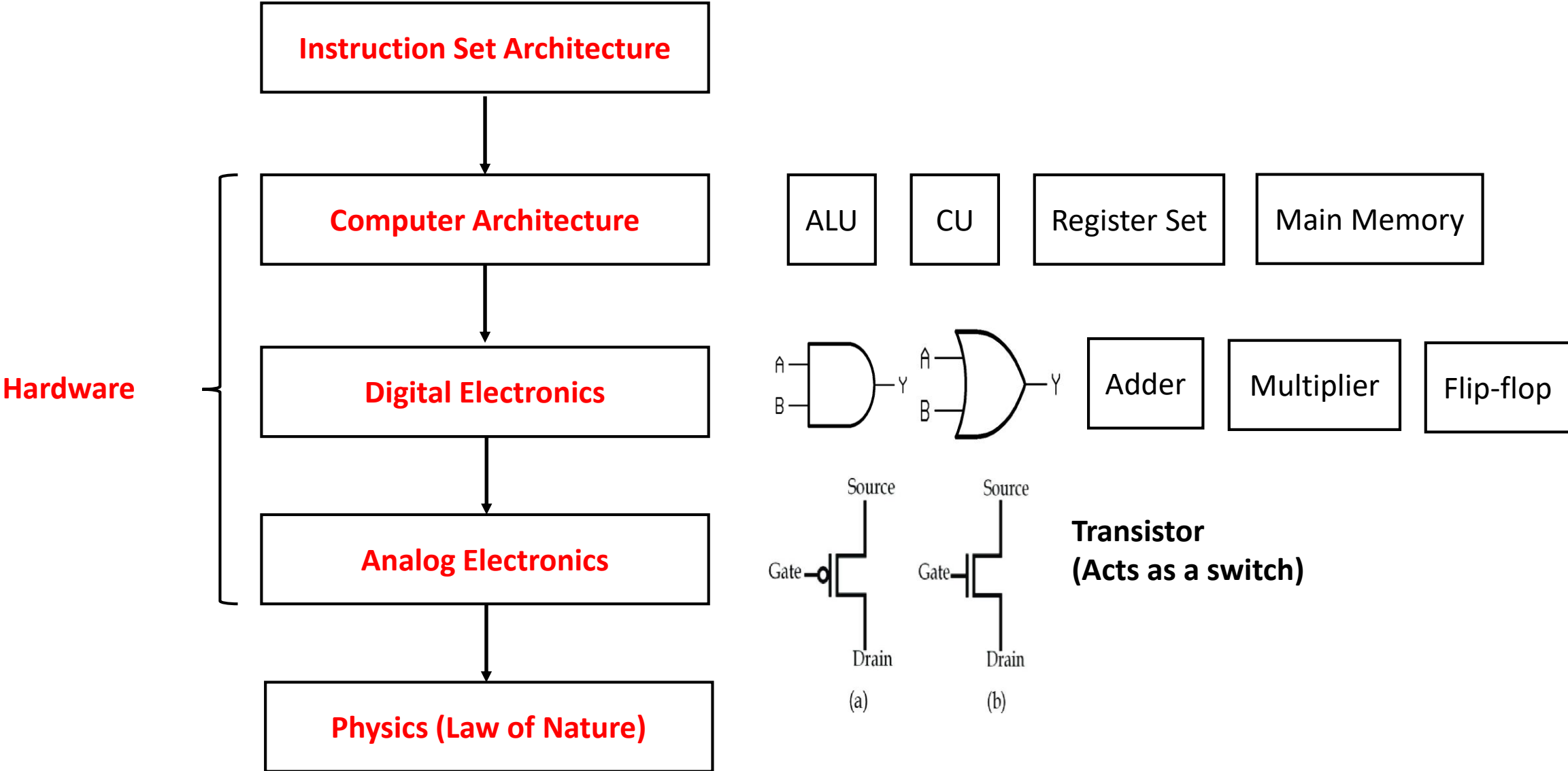
# উত্তর: Connection between High Level Language Program and Physics



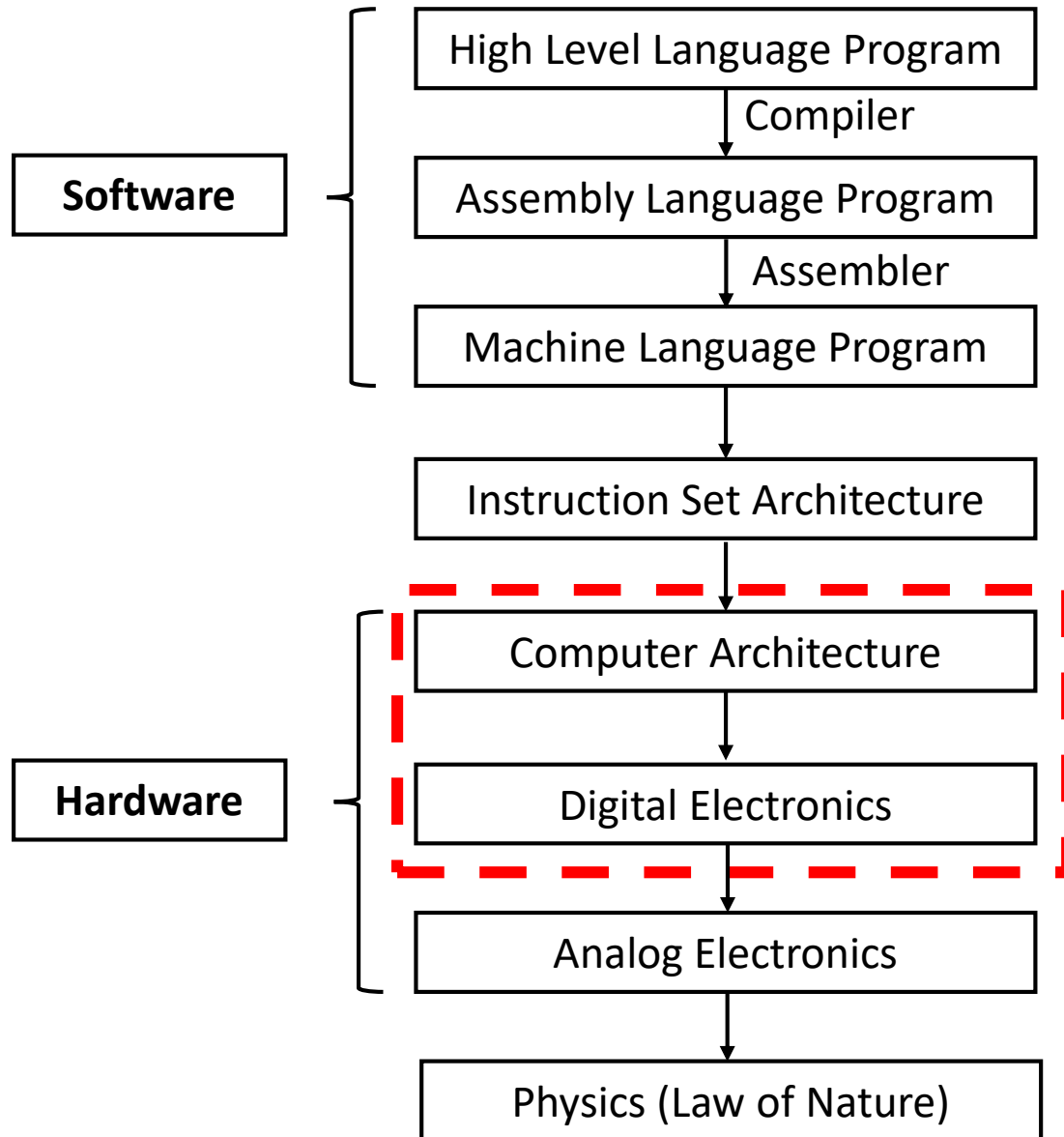
# উত্তরঃ Connection between High Level Language Program and Physics



# উত্তরঃ Connection between High Level Language Program and Physics



# Connection between High Level Language Program and Physics



We will learn in this direction.

# Analog Electronics



প্রশ্ন: Transistorএর কাজ কি?

উত্তরঃ গোটা পৃথিবীতে Transistorএর Role দুইটা।

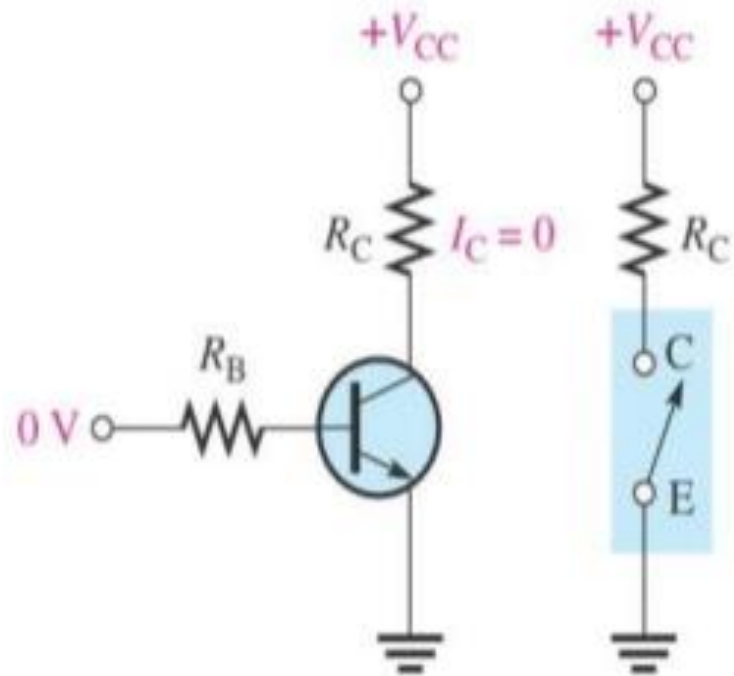
1. Switch
2. Amplifier

প্রশ্নঃ Transistorএৰ কাজ কি Computerএ?

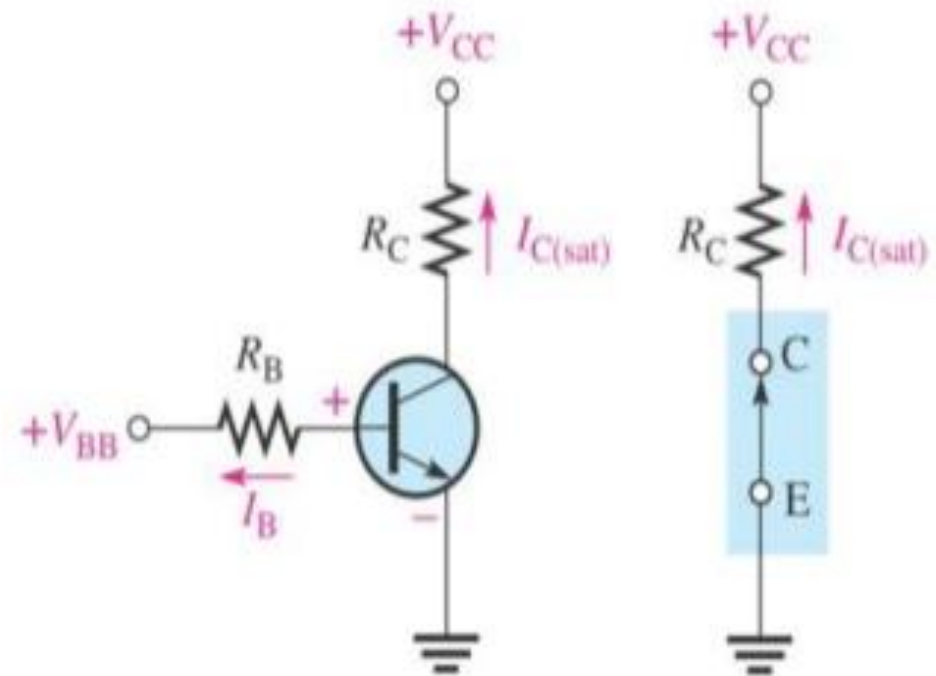
উত্তরঃ Transistor switch হিসেবে কাজ করে।

এর মাঝে ON/OFF করে।

# Transistor (BJT) as Switch

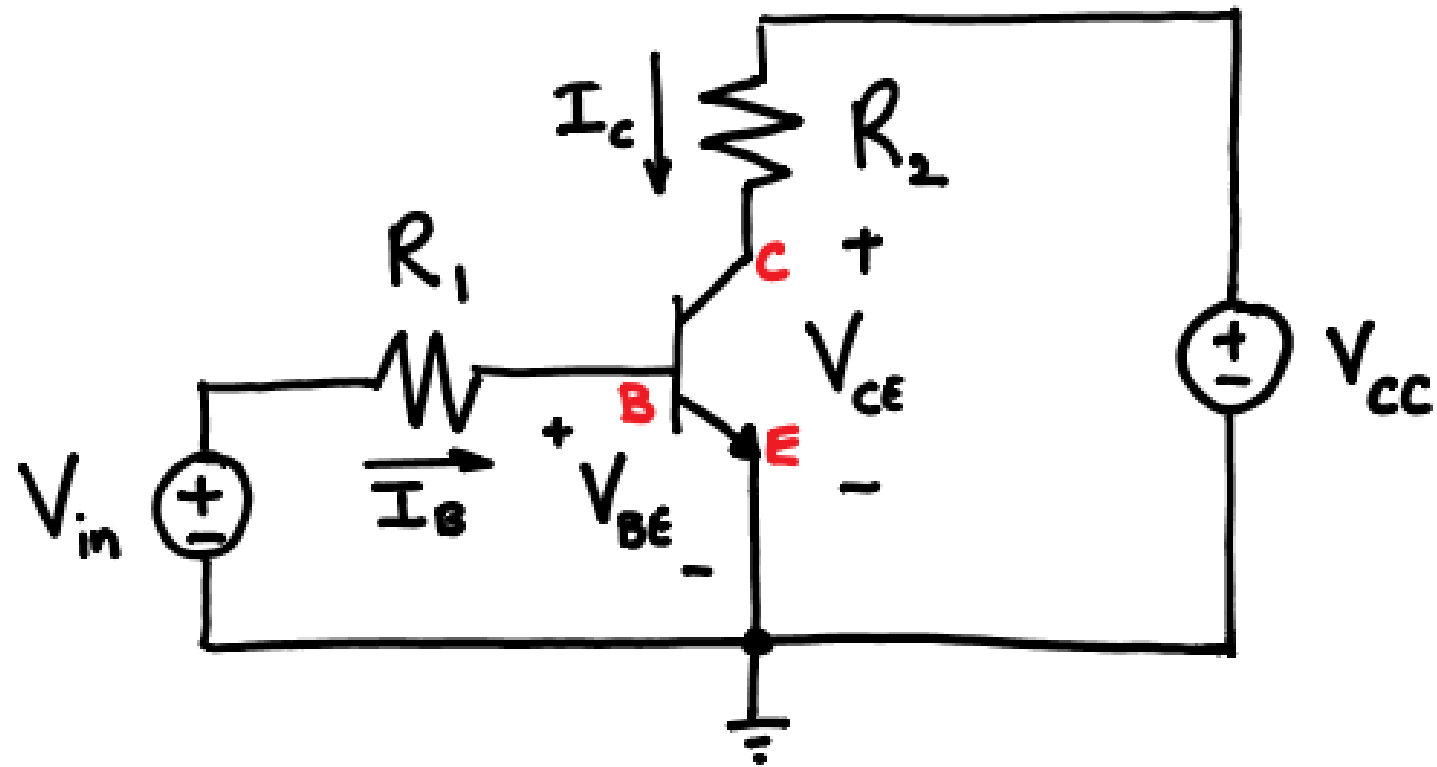


(a) Cutoff — open switch

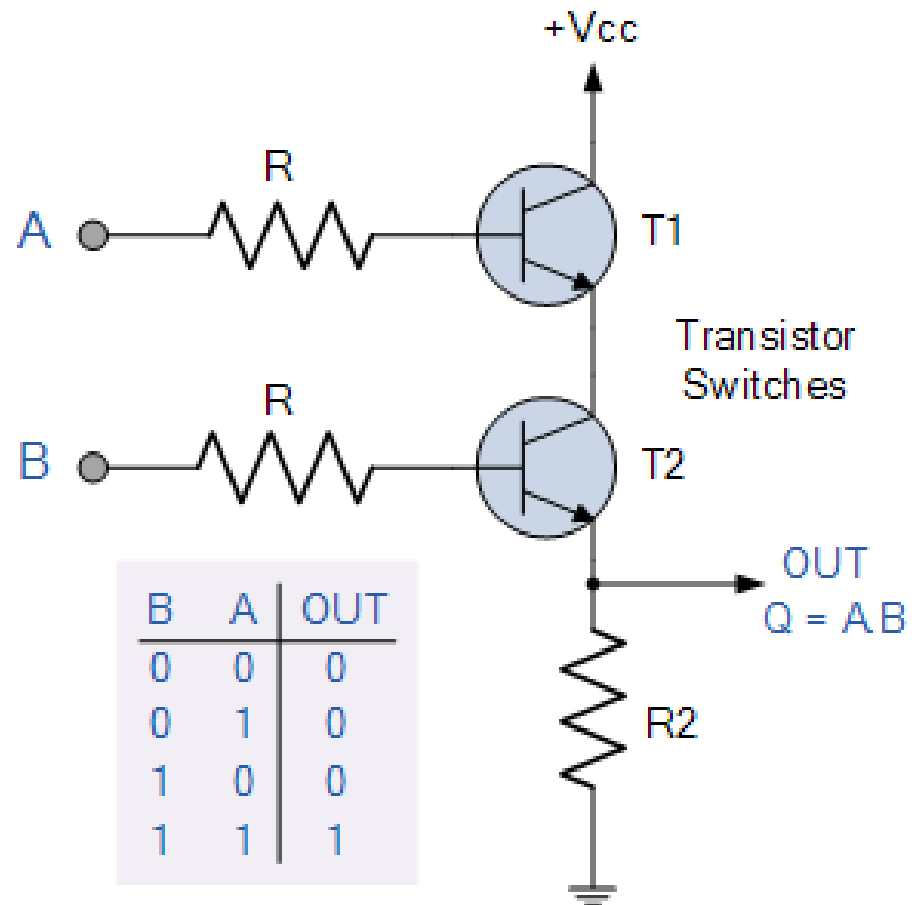


(b) Saturation — closed switch

## Transistor Circuit Diagram

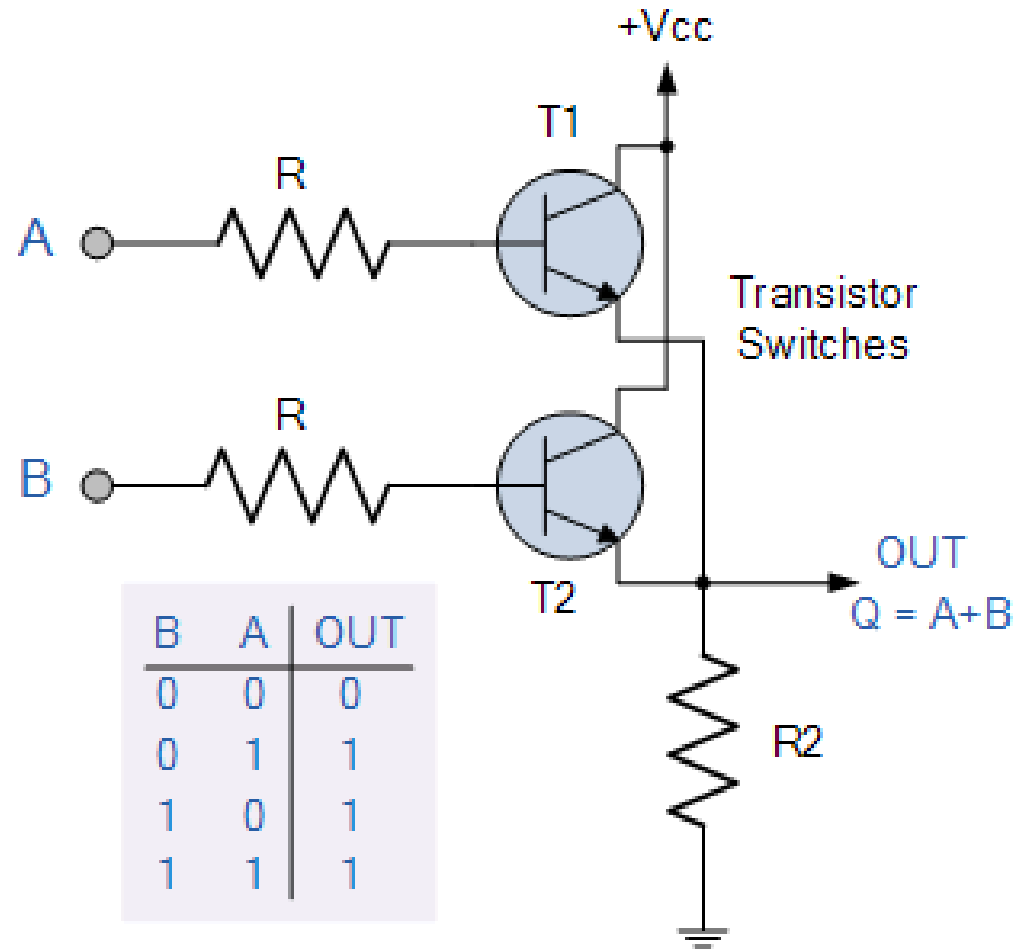


# 2-input Transistor AND Gate



Link: [https://www.electronics-tutorials.ws/logic/logic\\_2.html](https://www.electronics-tutorials.ws/logic/logic_2.html)

## 2-input Transistor OR Gate



Link: [https://www.electronics-tutorials.ws/logic/logic\\_3.html](https://www.electronics-tutorials.ws/logic/logic_3.html)



প্রশ্ন: Processor এ কোন transistor ব্যবহার  
করা হয়?

উত্তরঃ Processorএ CMOS transistor ব্যবহার  
করা হয়।

CMOS = Complementary Metal–Oxide–  
Semiconductor Field Effect Transistor

Next Day:  
CMOS

## Summary:

1. Computer তৈরি AND/OR gate দিয়ে এবং AND/OR gate তৈরি transistor দিয়ে।
2. গোটা পৃথিবীতে Transistorএর Role দুইটা Switching এবং Amplification।
3. Switch মানে ON/OFF করা। Transistor switch হিসেবে কাজ করার সময়
  - a. 5V দিলে transistor ON হবে (closed)।
  - b. 0V দিলে transistor OFF হবে (Open)।
4. Real life CPU (processor) তৈরি CMOS দিয়ে।

Thank You 😊