Theory (Memory, Architectures, Interrupts and Stacks)

1.

1.1

ROM (Read only memory): a form of non-volatile memory that is often found in computers and other electronic devices. Data contained in ROM cannot be electrically changed once the memory device is manufactured. ROM is used in embedded systems or where the programming does not need to be changed, calculators and other ancillary devices.

1.2

RAM (Random Access Memory: a type of computer memory that may be read and modified in any sequence, and it is commonly used to store working data and machine code. ON the other hand, ROM can only store the unchangeable data.

1.3

Differences between DRAM and SRAM:

DRAM	SRAM
Require to recharge the energy every few millisecond	Keep the data while the power is available
Built from small capacitors that leak energy	Built from a structure like D Flip Flop
Slower	Faster
Can store many bits per chip	Cannot store many bits per chip
Release less heat	Release more heat
Consume less power	Consume more power
Inexpensive	Expensive
Use for main memory	Use for cache

1.4

In USB thumb drives, flash memory is employed. Because important data storage does not integrate well with backups, we should not rely on it. The Neumann (or Princeton) architecture is distinguished by the use of a single way to reach a primary memory that contains both instructions and data. Separate memories are linked with Harvard architecture.

2.

8 589 934 592 bits that we need to address all bytes in system's RAM

3

Traditionally, von and access routes for instructions and data. Of course, there are several ways to arrange memory in between. Most contemporary processors, for example, have separate caches for instructions and data, but both caches are basically filtering requests to a single main memory that contains both instructions and data.

4

Cache memory, also called **cache**, supplementary memory system that temporarily stores frequently used instructions and data for quicker processing by the central processing unit (CPU) of a computer.

The aim of cache memory is to store program instructions that are often utilized by software throughout its general operations; this is why rapid access is required as it helps to keep the program running swiftly.

5

An interrupt is a signal generated by a device connected to a computer or by a program within the computer that causes the operating system to pause and determine what to do next.

+ 4 common type of interrupts: hardware interrupt, Software interrupt, Level-triggered interrupts, System Implementation.

5.1

An interrupt controller will poll all devices on a computer to see which one submitted the request. Polled interrupt is an inefficient form of data transmission that spends a significant amount of time confirming the readiness of a computer's peripherals.

6

Stack memory is a memory use method that allows system memory to be utilized as a first-inlast-out buffer for temporary data storage. A register known as the Stack Pointer is an important component of stack memory operation. The stack pointer specifies the current stack memory address and is automatically updated each time a stack action is performed.

6.1

The two extra stacks are allocated per CPU, as opposed to the standard kernel stack, which is created per process. The kernel must move to the proper stack whenever a hardware interrupt occurs (or a softIRQ is handled).

6.2

Functions of stack in programming:

+ Peek: Allows you to view the topmost element on a stack without actually deleting it.

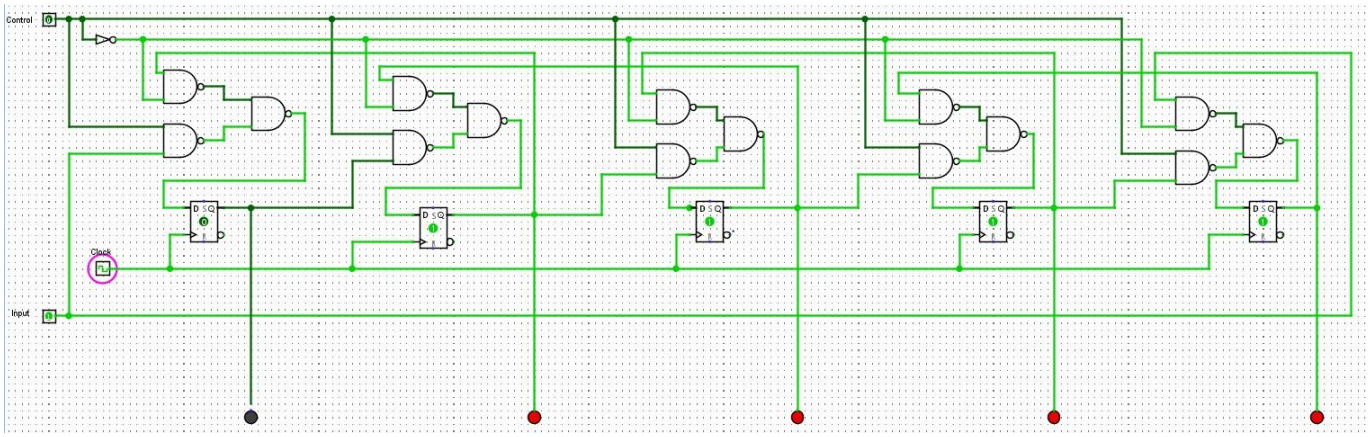
+ Swap: Also known as "exchange," this operation swaps the locations of the two top components of the stack, with the first element becoming the second and the second becoming the top.

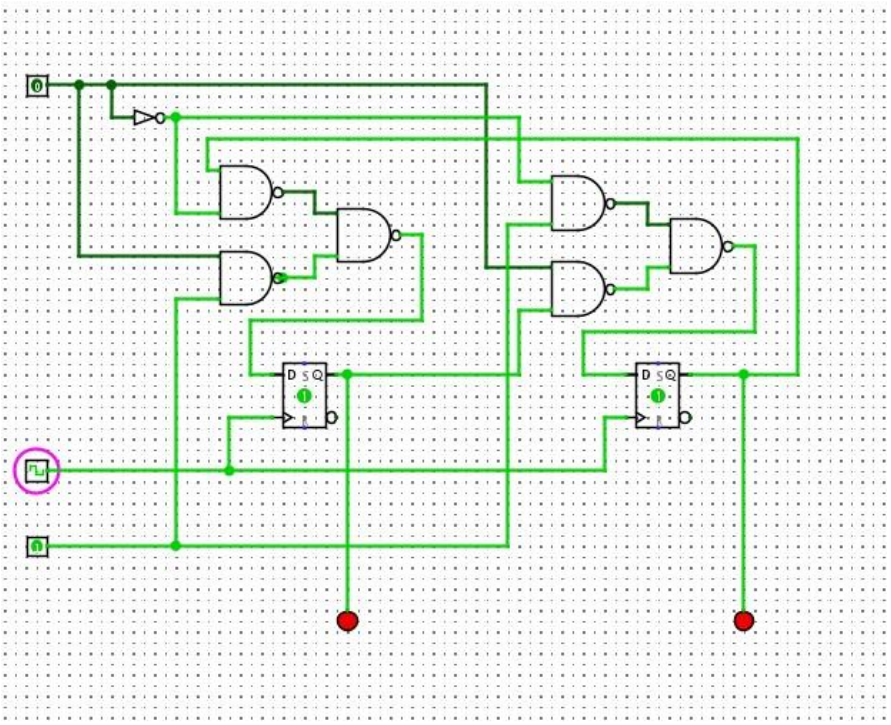
+ Copy: The highest element in the stack is popped and then placed back into the stack twice, resulting in a duplicate of the original element.

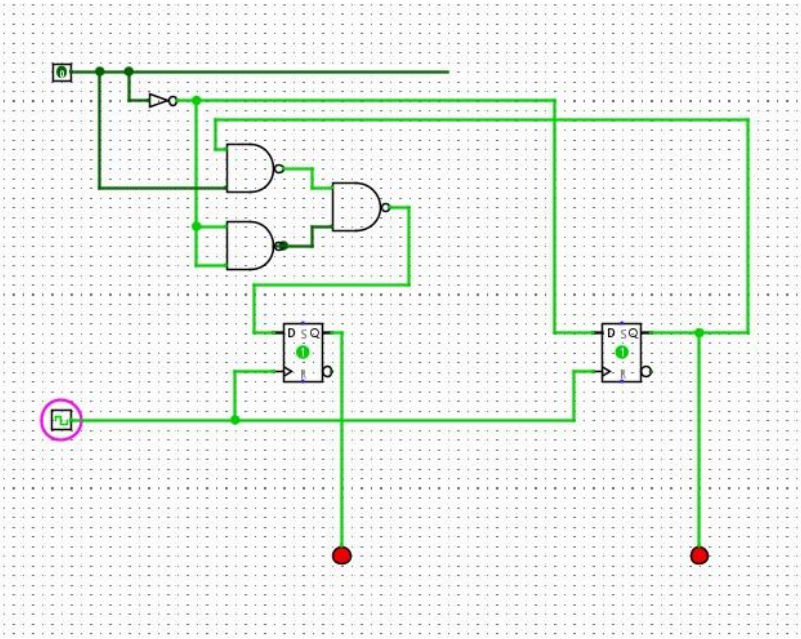
+ Rotate: Also known as "roll," this parameter defines the number of items in a stack that are rotated in sequence. Rotating the top four components of a stack, for example, would shift the topmost element into the fourth place while the next three elements moved up one position.

Practical - Stacks of Stacks!

5-bit deep Stack.



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