COS10004: Computer Systems
Lab 4

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Theory (Memory, Architectures, Interrupts and Stacks)

1)

1.1. ROM stands for Read-Only Memory, which is built with the main purpose for storing data on computers permanently.

1.2. RAM refers to Random Access Memory, which stores the data on the computers too, but only temporarily, different from ROM.

1.3. Data is available in static RAM until the power is turned off. Fast, larger silicon area per byte, consume not too much power. Whereas dynamic RAM can store data if its contents are updated often enough, does not require excessive power too, but have smaller area of silicon per byte.

1.4. USB thumb drives typically use flash memory, which erases data in block units, and rewrites the data through byte level. Since crucial data storage does not match the backups appropriately, we should not rely on it.

2)   8589934592 bits are required.

3)   In the Von Neumann computing architectures, the memory can store both data instructions, while the memory in the Harvard computing architectures is split into two halves, to store the two foregoing factors.

4)   Cache memory (CPU memory) is a form of SRAM that frequently stores consumed data, programs, and applications while also allowing a processor to access it quickly.

5)   The Running Process is interrupted when a user calls another Process while one is being carried out by the CPU. This situation is called Interrupt.

Different types of Interrupts:

- Internal Interrupts
- Software Interrupts
- External Interrupts

5.1. When a computer or other controlling device uses low-level hardware to wait for an external device to check its readiness or condition, this procedure is known as polling.

Polling is uncommon since:

+) Wasting lots of time for inspecting inactive hardware.

+) Attaining no advantages from stacks.

+) One freeze device might make other computers become unresponsive.

6.   A stack is a conceptual structure based on the last in, first out (LIFO) principle and encompasses homogenous components. It is an abstract data type that is frequently used and has two main operations of push and pop. Computer memory management and programming both employ the stack notion.
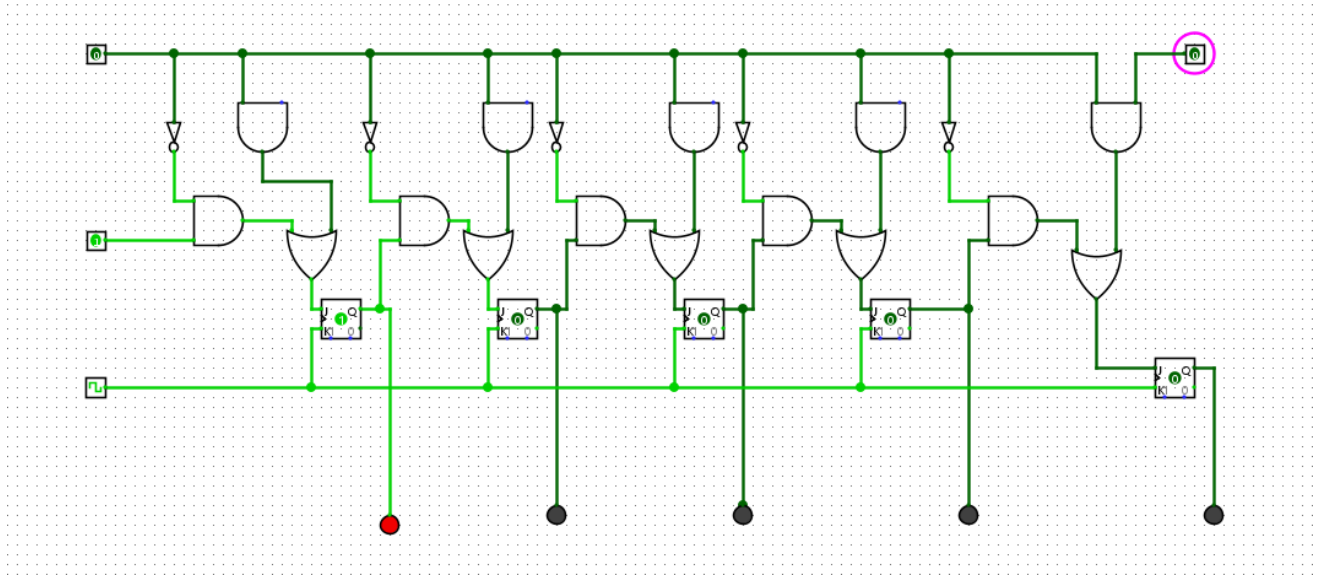
6.1 A hardware-triggered function is regarded as a type of interrupt handler, which can nest. Therefore, the only practical data structure return addresses can be stored appropriately is a stack.

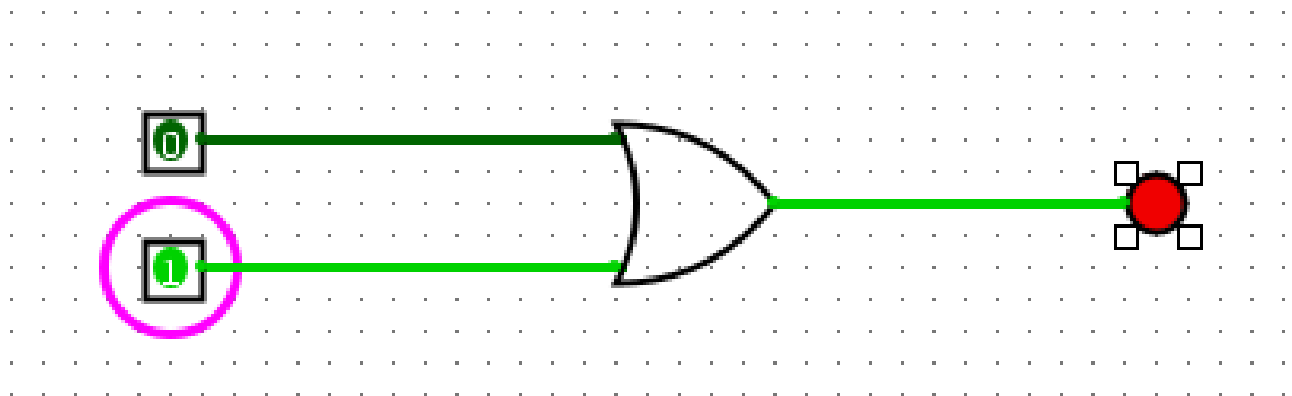6.2 The benefits that stacks can contribute to programming:

- Peek: Enables viewing of the highest stacking piece without removing it.

- Swap (exchange) Swapping the two top pieces' locations.

- Duplicate: Similar to creating a copy version of the topmost item in the stack.

- Rotate: Illustrating the number of elements rotated in the stack.
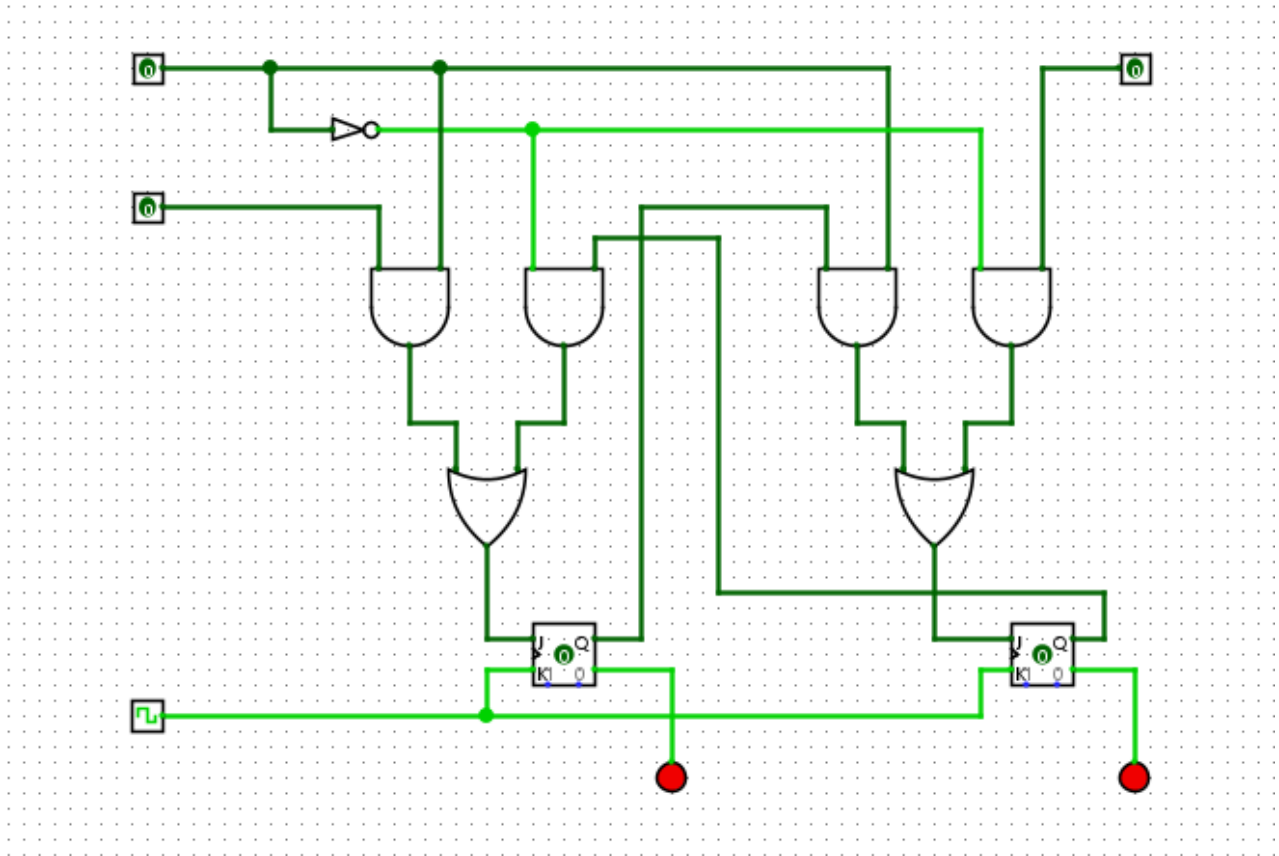
Practical – Stack of Stacks!

7)

10)

11)

12)