**What is pipelining?**

pipelining is the ability for a cpu to start and compleate multiple instructions in different stages with out having to wait that an instruction set is fully compleated before starting a new one

is a set of data processing elements connected in series, where the output of one element is the input of the next one. The elements of a pipeline are often executed in parallel

**What are the choices to handle instructions in a pipeline if a branch instruction ahead of them skips to a new address?**

You can compleate execution of the instructions or you can flush the pipeline

**What is cache memory? When and why is it useful.**

Is a fast access memory near or inside the cpu.

Caches are useful when two or more components need to exchange data, and the components perform transfers at differing speeds. Cahces solve the transfer problem by providing a buffer of intermediate speed between the components. If the fast device finds the data it needs in the cache, it need not wait for the slower device.

**What are parallel data paths (parallel ALUs)?**

are Alus data perform the same sequence of instructions on different sets of data SIMd and found on GPUs

**What is instruction pre-fetch and branch prediction?**

the techinche used in microprocessor to speed up the execution of the program by reducing the wait state from the bus signal. Prefetching occurs when a processor requests an instruction from main memory before it is actually needed. Once the instruction comes back from memory, it is placed in a cache. When an instruction is actually needed, the instruction can be accessed much more quickly from the cache than if it had to make a request from memory.

a branch predictor is a digital circuit that tries to guess which way a branch (e.g. an if-then-else structure) will go before this is known for sure.

is a digital circute that tries to guess wich way a branch will go before this is known for sure and improves the flow in the instructuon pipeline.