1. a) **Notes**

- **Previliged Instructions**
  - Is the instruction that can run only in **kernel mode**
  - Attempt at execution in **user mode** → treated as an illegal operation & will not run.
- **Trap**
  - Is a special hardware instruction
  - Is a type of synchronous interrupt [1]
  - Is caused by an exceptional condition [1]
    1. Division by zero [1]
    2. Invalid memory access (segmentation fault) [1]
    3. Previleged instruction by **user mode** code [2]
  - Usually results in a switch to **kernel mode** → Operating system performs action → Returns control to oroginal process
- **Trap Instruction**
  - Is executed when a user wants to invoke a service from the operating system (i.e. reading hard drive) in **user mode**
- **User Mode**
  - Executing code has no ability to *directly* access hardware or reference memory [3]
  - Crashes are always recoverable [3]
  - Is where most of the code on our computer are executed [3]
- **Kernel Mode**
  - Executing code has complete and unrestricted access to the underlying hardware [3]
  - Is generally reserved for the lowest-level, most trusted functions of the operating system [3]
  - Is fatal to crash; it will halt the entire PC (i.e the blue screen of death) [3]

References

a) Wikipedia, Trap (computing), link
b) University of Utah, CS5460: Operating Systems Lecture 3 - OS Organization, link
c) Coding Horror, Understanding User and Kernel Mode, link