Chapter 3

- Laser printer (9608 s20p13 Q2a)
    - The drum is initially given an electrical (negative) charge
    - The laser beam (bounces off moving mirror) scans back and forth and discharge all the point/area that does not includes the 'shapes' or 'text' (will be print out) of the drum
    - (Only the area of the 'shapes' or 'texts' of) The drum is then coated with (positive) charged toner（鼓粉）
    - The drum is rolled over a (negative) charged paper
    - (All the positive charged toner of) The 'shape' or 'text' is transferred to the paper
    - The paper passes through the fuser to seal the image
    - All electric charged is removed from the drum
- 3D printer (9608 s20p11 Q2b.i)
    - Object is designed using CAD (computer aided design) software
    - The software split the object into slices
    - The data about each slice is sent to the printer
    - The solid plastic is melted and transferred to the nozzle
    - A motor moves the nozzle into position
    - The nozzle extrudes（挤出）the molten plastic
    - This repeats (step 5 and 6) until the layer is complete
    - A fan cools the layer
    - This process (step 4 to 8) repeats for each layer
- Microphone (9618 w21p12 Q3a)
    - Microphone has a diaphragm
    - Incoming sound waves cause the vibration of the diaphragm
    - Causing a coil to move past a magnet
    - Electrical signal is produced
- Speaker (9608 w17p11 Q5a.ii)
    - Takes an electrical signal and translate it into physical vibrations to create sound waves
    - An electrical current in the coil create electric magnetic field
    - Changes in audio signal (sent from computer) will cause changes in direction of the electrical current
    - Changes in electrical current in the coil changes the direction of polarity of electro magnet
    - Electro magnet is attached to a parament magnet
    - The coil to vibrates
    - Movement in the coil causes the diaphragm to vibrate
    - Sound waves is produce and transmitted in air from the diaphragm
- Primary storage
    - (main) Memory

- RAM (random access memory)
    - Purpose (9608 s20p11 Q2.b.ii, p13 Q2b)
        - Stores currently running parts of (something e.g. 3D printer, laser printer) software/program
        - Stores currently process (of something e.g. washing, printing)
        - Stores data about (e.g. washing machine, printer) such as (e.g. plastic level (for 3D printers), temperature (for washing machines))
    - Static RAM (SRAM) (9608 w19p13 Q1b.ii)
        - Often used as cache
        - Made from flip-flop
    - Dynamic RAM (DRAM) (9608 w19p13 Q1b.ii)
        - Requires refreshing (recharging)
    - Difference
        - SRAM is more expensive than DRAM
        - SRAM has faster access time than DRAM
        - SRAM has more complex circuitry than DRAM
        - DRAM has to be refreshed, SRAM does not required to refresh
        - DRAM often used in main memory, SRAM often used in cache memory
- ROM (read only memory)
    - Types of ROM
        - ROM (read only memory) 不能修改
        - PROM (programmable ROM) 只能修改一次
        - EPROM (Erasable PROM) 可以修改多次，需要取出
        - EEPROM (electrically EPROM) 更方便修改多次，不需要取出
    - Purpose
        - Stores start-up instructions (of something e.g. printer, washing machine)
        - Stores OS (of something e.g. printer, washing machine)
- Difference between RAM and ROM
    - RAM is in volatile (容易失去的) || ROM is non-volatile (不容易失去)
    - RAM can change regularly || ROM usually do not change
    - RAM is read/write || ROM is read only

- Secondary storage
    - Uses of secondary storage (9608 w17p11 Q5)
    - Purpose (9608 w19p12 Q6b.i)
        - To store files in long term
    - Hard disk drive (HDD) / Magnetic hard disk (9608 s21p12 Q8g)
    - How to use?
        - The disks has one or more platters made of aluminum or glass
        - The surface of the platters has ferrous oxide which can be magnetised
        - Platters are mounted（堆在）on a spindle
        - The platters are rotated at high speed
        - There are read-write heads mounted on an (actuator) arm above each surface of the platters

        - Electronic circuits control the movement of the arm and then the heads
        - The surface of the platters are divided into concentric tracks and sectors
        - When writing the disks, a variation（变动）in the current through the head produces a variation in magnetic field on the disk
        - When reading the disks, a variation in the magnetic field on the disk produces a variation in current though the head
    - Advantage (9608 s18p13 Q7c)
        - Less expensive per unit of storage (compare to SSD)
            - Cost is low even if large amount of HDD is purchased
        - Larger storage capacity（上限）
            - To store video, sound, image file with large file size
        - Slower degradation（损坏）of data
            - So will last longer under heavy use
    - Solid state drive (SSD)
    - Definition
        - No moving parts
        - SSD state memory is volatile (容易失去) 寿命短
        - Make use of blocks of integrated circuits（集成电路）
    - Advantage (9608 s18p13 Q7c)
        - No moving parts so no noise
        - Faster read and write speed (time)
        - Do not need to wait to load the (video, image, sound) file (for a long time)
    - CD/DVD drive/writer
    - Optical disk drive
    - USB flash drive
    - Buffer
    - A temporary storage area
- External (removeable) secondary storage (9608 w17p11 Q5b)
    - Purpose
    - Additional secondary file storage
    - Backup of files
    - Transfer files to another computer
    - External HDD 注意这里有区别一般都是 internal HDD (9608 s17p12 Q2c.i)
    - External SSD 注意这里有区别一般都是 internal SSD (9608 s17p12 Q2c.i)
- Touchscreen
    - Resistive touchscreen (9608 s20p12 Q1a, 9608 s18p13m Q7a)
    - Resistive touchscreen has two charged layers/plates with a gap/air between the layers
    - When finger touches the screen, pressure causes the upper layer to touch the bottom layer, and completes a circuit
    - Point of contact is (created and) registered
    - Coordinates (horizontal and vertical position) of the point (of contact) is calculated
    - Capacitive touchscreen (9608 s18p13m Q7a)

- Capacitive touchscreen is made of materials that store electronic charge
- When finger touches the screen, electronic charges transfer to the finger
- Sensor at the screen corners detects the changes (in electronic charge)
- Point of contact is registered
- Coordinates (horizontal and vertical position) of the point (of contact) is calculated

- Virtual reality (VR) headset
    - An output device worn on the head that gives the user a 'virtual reality experience'
    - Used in gaming software to simulate od someone in world experience
    - VR will have stereo sound（立体声）, embedded head movement sensors, separate image projection for each eye
    - VR headset must respond very fast with rendered（渲染的）in respond to various input, the GPU (graphic process unit) is responsible for it

- Sensors
    - Temperature
    - Pressure
    - Infrared
    - Sound

- Logic gate (9618 s21p11/13 Q8, 9618 s21p12 Q3, 9618 w21p11/13 Q3)
    - OR
    - AND
    - NOT
    - NOR
    - NAND
    - XOR