Computer Systems Revision Summary

1. Data Representation

- Computers store integers using the Two's Complement system
- Real numbers are represented using Floating Point
- The range of numbers represented depends on the number of bits used for the exponent, their accuracy on the mantissa
- 8 bit ASCII is limited to 256 different symbols when representing character sets; Unicode uses 16 bits and can represent many more characters
- Graphics can be represented by Bit maps whose advantages are simplicity and pixel level editing, but whose disadvantages are size and non scalability
- Vector graphics can be used to represent objects – they can be scaled and take up less space, but cannot be edited at pixel level
- The greater the bit depth of a bit mapped graphic, the greater the file size;
- Bitmapped graphics are often compressed – using lossy or lossless compression

2. Computer Structure

- A computer system consists of input output devices, a CPU and memory plus backing storage
- The CPU consists of an **Arithmetic and Logic Unit**, a **Control Unit** and registers
- The stored program concept allows a computer to perform a number of different tasks. This makes it different from any other machine
- The Fetch Execute cycle: Copy **Program Counter** to **Memory Address Register**
  Activate **Read** line
  Transfer data from memory to **Memory Data Register**
  Increment **Program Counter**
  Transfer instruction form **Memory Data Register** to **Instruction Register**
  Decode Instruction
  Execute Instruction
- Static RAM is fast memory used for cache memory
- Dynamic RAM is used for (slower) main memory
- The **Control bus** is a collection of lines for read, write, clock, reset, interrupt etc.
- The **Address bus** is a one way bus whose width determines the number of addressable memory locations
- The D**ata bus** is a two way bus whose width determines the word size of the processor
- Accessing memory.

3. Computer Performance

- Indicators of computer performance include: clock speed, MIPS and FLOPS;
- Benchmark testing is used to measure performance;
- Other factors affecting performance include: data bus width, cache memory and data transfer rates
- Increasing clock speed, memory and storage capacity may improve performance.
- The functions of an Interface are: Data conversion, Voltage conversion, Data storage, transmission of control signals and transmitting status information
- Cache memory is SRAM used to make memory access faster. Write-through cache is where the memory is updated at the same time. Write-back cache is where the memory is not updated until the cache is cleared and is faster than write-through cache
- Virtual memory is where part of the hard disk is used by the processor as if it was RAM

4. Peripherals

- Peripherals can be compared according to criteria such as speed, capacity, cost and compatibility
- A buffer is memory used to store data in transit between a peripheral and the CPU
- Spooling is where data is stored on disk to compensate between the difference in speeds between the processor and the peripheral

5. Networking

- A LAN is characterized by low bandwidth, high error rate a WAN by high bandwidth, low error rate
- Physical resources shared on a LAN are peripherals, storage space, and Internet access
- Services provided by a LAN are central backup, management, security, and communications such as email, news, Intranet.
- A WAN can provide information and entertainment services, E-commerce, email, newsgroups, Forums, and distributed processing
- On any network, nodes need to be uniquely identified – this may be by host name, MAC address, IP address or a combination of these.
- A **peer-to-peer** network is often 5 or fewer machines sharing resources on an equal status. There is little security and often no central backup.
- **Client server** networks are larger, have dedicated servers, network managers and other resources. They have network security imposed by dedicated servers.
- **Thin client** systems are where most of the processing takes place on the server.
- Servers on a network may be File servers, Print servers, Applications servers, Email, News and Web servers or Proxy servers.
- Common network topologies are bus, ring, star and mesh

6 Using Networks

- A **hub** or multi-port repeater sends packets out to every connected port
- A **switch** sends packets out according the MAC address of the recipient
- A **router** directs and filters packets according to IP address
- On a LAN Cabling can be Coaxial, UTP or Fibre
- For domestic users dialup, ISDN or Broadband (cable, satellite or ADSL) is available
- Wireless networking is currently available over short distances for LANs
- The copyright act and the Computer misuse act are relevant to the misuse of computer networks.

7. Computer Software

- The boot ROM is responsible for starting up the process of loading and# operating system.
- The main functions of a single user OS are: providing a user interface, file management, managing input and output devices, memory management and the kernel (process management)
- Utility programs may include virus checker, disk editor and defragmenter
- Standard file formats should be used if you wish to transfer data between applications and between different computer systems

8. Supporting Software

- Application software will have minimum requirements such as memory, available storage space and operating system version
- Viruses can be classified as file virus, boot sector virus or macro virus
- Other infections include Trojans, worms and spy-ware
- Protection against viruses is done using checksums, virus signatures, heuristic detection and memory resident monitoring