ITGS REVIEW FOR IB EXAMS

TOPIC 1: INTRODUCING INFORMATION TECHNOLOGY

1.1 Information systems

1.1.1 Define information.

According to one definition, information means communication that has value because it informs. By this definition, computers turn raw data into useful information. In the language of communication and information theory, the term *information* can be applied to just about anything that can be communicated, whether it has value or not. This broader definition is more useful in a world of interconnected computers where the output from one computer might be the input of another.

Information is data combined with units of measure (quantitative) or combined with accompanying meaning (qualitative).

1.1.2 State five examples of sets of data that may be used in information systems.

- Stores keep a record of your name and address when you purchase items.
- Airlines keep a record of passengers' personal information.
- Libraries have all of their items on an inter-library system.
- Banks keep records of account transactions.
- Schools keep students' names, addresses, grades, gpa's, etc.

1.1.3 List four specific items of data that may be contained in any one of these sets of information stated in 1.1.2.

Airlines keep a record of passengers' addresses, phone numbers, flight departure/arrivals and the amount of baggage they are carrying.
Libraries keep a record of all of their holdings; books, magazines, newspapers. They also keep a record of all those who have withdrawn books, etc. from the library, the due dates, and whether the book is overdue.
Schools keep a record of grades, credits, names of students, addresses, parents names, tuition payment information, etc.
Banks keep records of names, addresses, phone numbers, amounts of loans, amounts owed on loans, amounts deposited, etc.

1.1.4 Describe the four components of an information system.

The input devices, output devices, processor (CPU), and storage devices make up an information system. Input devices accept input from the outside world. The most common input device is the keyboard. Output devices send information to the outside world. Most computers use a TV-like monitor as their main output device and some kind of printer to produce paper printouts. The processor (CPU) processes information, performing all the necessary arithmetic calculations and making basic decisions based on information values. Storage devices are used to store information. They are made up of *primary storage* (this is the computer's memory; RAM and ROM) which is used to store programs and data that need to be instantly accessible to the CPU. *Secondary storage* (a type of storage that allows the computer to record information semi-permanently so that it can be read later by the same

computer or by another computer; includes disk and tape drives) stores the information the computer sends to it long-term.

1.1.5 Discuss four processing functions of the software in an information system.

One processing function that software does in an information system is perform calculations. People can enter numbers into the computer and tell it to add, subtract, and do whatever mathematical processes need to be done. The software also makes spreadsheets. The spreadsheets can be used to make reports. Also the software allows the user to do basic word processing and typing. Lastly, the software in an information system allows people to make graphs showing changes in information and data.

1.1.6 Compare the meaning of the terms data, information, knowledge and wisdom.

The term data refers to numbers, codes, words or phrases without units, or other items that define of give meaning to these original elements. Information, on the other hand, is data combined with units of measure (quantitative) or combined with accompanying meaning (qualitative).
Knowledge is an understanding that humans derive by reasoning based on data and associated information. Examples of data are simple numbers, such as 123 and 456. Examples of information are $1.23 per dozen eggs and $4.56 per dozen eggs. Knowledge is an understanding that $1.23 is a better buy than $4.56. Wisdom may include judgments about the nutritional value and health value of the eggs, or about the relative value of eggs as a source of protein compared with other sources.

1.1.7 Compare the terms "computer abuse" and "computer crime." (Chapter 2, green book; pg. 360-368, 376 confluence)

Computer abuse with respect to computer systems, is using computers and networks to perform irresponsible to unacceptable acts. Abusive acts may include unauthorized access, sending messages or making available files containing offensive language or pornographic materials; repeated sending of unwanted messages, or any other act considered unacceptable by the community sharing the resources. Computer crime is any illegal or unauthorized behavior in connection with computers and computer networks. Examples of computer crimes include computer sabotage, unauthorized access, computer forgery, damage to computer data or programs, computer fraud, computer espionage, unauthorized use of a computer, or unauthorized use of a protected computer program.

1.2 Individuals and Machines

1.2.1 Describe two situations where it is more appropriate to use a machine than a person.

Machines can be used to dismantle a bomb or a land mine. It is more appropriate to use a machine because sending in a person to do this could be dangerous and lead to injury or even death. Machines can also be used to obtain scientific samples from a volcano. It is more appropriate to use a machine because a human would not be able to withstand the heat, whereas a machine could tolerate it.

1.2.2 Describe two situations where it is more appropriate to use a person than a machine.

It is more appropriate to use a person in surgery because surgery requires knowledge of the procedure in order to make quick decisions on a case by case basis in case something goes wrong. It is also more appropriate to use a person as an air traffic controller because they have to make decisions on a case by case basis.

1.2.3 Explain the beneficial attributes of both machines and people for performing particular tasks.

Machines are better for some tasks such as repetitive, boring work and dangerous work. People are better at doing jobs that require judgment and experience such as being a doctor.

1.2.4 Discuss the characteristics of computers that assist humans in performing complex tasks including preparing budgets, creating address books, manipulating images, and editing videos.

Computers assist humans in preparing budgets very well because they can do long calculations faster than a human would be able to. Computers assist in creating address books because they can set fields for things such as "Name" and "Phone Number" and then putting the information in order such as alphabetical order. Computers assist with manipulating images because we can scan them into the computer and then use programs to stretch, shrink, and crop images. Computers assist with editing video because we can put a part of a video on the computer, watch it, and then delete parts, add parts, or rearrange scenes easier.

1.2.5 Discuss three situations involving ethical considerations that can arise from the use of machines/computers in place of people including the field of medicine.

Can a robot operate on a human? Surgery depends on knowledge and applying it as well as critical decisions that must be made quickly and are based on a case by case basis. Only experienced surgeons have this knowledge and judgment which robots do not have.

Can robots replace teachers? Robots would not able to do things such as mark essays written by students. Teachers the advantage of knowing their students and would have a better understanding of what their students are trying to express.

Can robots replace judges? Robots would only know what the law was and would not be able to judge defendants on a case by case basis. Robots do not have an opinion as that is a human characteristic. Therefore, they would not be able to accurately judge whether or not someone was guilty or innocent.

1.3 An Information Economy

1.3.1 State three examples where information has economic value.

Information has economic value in sales, production costs, and potential customers and markets.

1.3.2 Explain how information can be a commodity with economic value.

Information can have economic value when the information is used for mailing lists. The information is sold to companies who then mail out information to people in hopes that they will buy something form their company.

1.3.3 Compare a production economy with an information economy.

An information economy is an economy that is highly dependent in the collection, storage and exchange of information. Many businesses now deal in managing and adding value to data, and selling information derived from the data.
A production economy is highly dependent on product and sales. A production economy sells items, rather than data.

1.4 A Digital World

1.4.1 Define digital data.

Data captured, stored or transmitted in binary form.

1.4.2 Define analog data.

Data that is stored and sent in one continuous wave similar to that of a sound wave.

1.4.3 Discuss two advantages of storing data in digital form compared with analog form.

Most digital circuits are easier to design and operate which is one advantage. The second advantage is that digital form is made up of smaller chunks while analog is one continuous wave. The advantage of this is that since the pieces are smaller, it is easier for the computer to understand digital form. Disks are also easier to store than paper files.

1.4.4. State one disadvantage of storing data in digital form.

One disadvantage of storing data in digital form is that it cannot be sent directly over the telephone lines to another computer. Instead, it must first be converted into analog through the modem, be sent over the phone lines, and then be converted form analog back into digital through a modem on the receiving end.
Also, forgetting to back up your data; computer crashes, corrupted data are also disadvantages.

1.5 Making the Connections

1.5.1 Define network (information system).

Any set of computer systems, connected by cables, phone lines, or radio communication methods, which share data (IB definition of network).
A system, usually computer based, into which data is placed, in which data may be processed, from which data is selected and may be analyzed, and from which reports may be produced. (IB definition of information system)
The collection of people, machines, data and methods organized to accomplish specific functions and to solve specific problems. (Book definition of information system).

1.5.2 Explain three advantages of networked information systems.

Networks allow people to share computer hardware, reducing costs and making it possible for more people to take advantage of powerful computer equipment. Networks also allow people to share data and software programs, increasing efficiency and productivity. Lastly, networks allow people to work together in ways that are difficult or impossible without network technology.

1.5.3 Outline two disadvantages of networked information systems.

- Viruses
  - Can be hidden in programs
  - When programs are shared, viruses can be spread to other computers over the network.
  - Viruses could cause enough damage to collapse an entire network.

- Hacking
  - Sensitive information can be stored on networks.
  - Hackers can break into systems.
  - Sensitive information can be stolen.

1.5.4 Discuss three social issues involving ethical considerations that can arise from the use of networked information systems.

Three social issues are the offensive material that can be found on the Internet, such as web sites involving pornography or racism, people becoming dependent upon the Internet, and "electronic sweatshops." Anyone is allowed to put whatever they want on the Internet and anyone is allowed to access it, including children. Some of the material on the Internet would be considered offensive by some people, but, if censored, it would go against freedom of speech. Some people have become very dependent upon the Internet. They go on the Internet to talk to people who they really don't know. They use the Internet as a replacement for human contact which can be psychologically damaging. "Electronic sweatshops" are places where employees are forced to sit in front of the computer entering data or do some other type of work on the computer. Often the health and happiness of the employees is ignored. The equipment the employees are using are often not ergonomically beneficial which can cause back, neck, and wrist problems. They are also often monitored by how many keystrokes per minute they type and there are cameras surveying them. This can lead to a lot of stress and pressure which is not healthy.

Also consider the amount and types of information that are stored on individuals; privacy related to this information; accessibility to this information.

TOPIC 2: INFORMATION TECHNOLOGIES: TOOLS AND IMPACTS

2.1 Hardware (3h)

2.1.1 Define *hardware.*

Computer and network equipment consisting of transistors, circuit boards, wiring, connectors, disk drives, cables, and similar physical or tangible components.
The physical parts of a computer which are the CPU, monitor, printer, keyboard, mouse, etc.

2.1.2 Describe one general function of each of the hardware components of a computer system: input, output, processor (central processing unit) and storage.

Input: raw data put into a computer system for processing.
Keyboard: the standard input device for entering text and numbers into a computer
Mouse: a hand-held input device that, when moved around on a desktop or table, moves a pointer around the computer screen.
Trackball: remains stationary while the user moves the protruding ball to control the pointer on the screen.
Touch pad: is a small flat panel that's sensitive to light pressure. The user moves the pointer by dragging a finger across the pad.
Track point: tiny handle that sits unobtrusively in the center of the keyboard, responding to finger pressure by moving the mouse in the direction it's pushed.
Joystick: gearshift-like device; found on many video games
Graphics tablet: pressure sensitive, so they can send different signals depending on how hard the user presses

Touch screen: can respond when the user points to or touches different screen regions (found in airports, public libraries, ATM machines and stores)

Output: devices that send information to the outside world
Video monitor: receives messages from the computer
Printers: allows a computer to produce a hard copy on paper of any information that can be displayed on the computer's screen

Impact printers
- line printers
- dot-matrix printers

Nonimpact printers
- laser printers
- ink-jet printers
- plotters

Audio Output: synthesizers, sound cards, etc.
Central Processing Unit (CPU): processes information, performs all the necessary arithmetic calculations and making basic brain decisions based on information values; the computer's "brain".
Storage: devices that are used for storing information; disk drives are the most common storage devices.
Primary Storage: the computer's memory, used to store programs and data that need to be instantly accessible to the CPU. There are two types, RAM and ROM. RAM stands for Random Access Memory; ROM stands for Read Only Memory. RAM is volatile, meaning all data in RAM is lost when the power is turned off. ROM is non-volatile, meaning it keeps all it's data regardless of power status. You cannot write anything to ROM. RAM is also known as working memory.
Secondary Storage: media, including disks and tape drives, serve as long-term storage media.

2.1.3 Explain the features commonly used to describe the hardware specifications of a computer system including speed of the CPU, memory, storage, operating system and monitor.

Speed of the CPU is measured in units called megahertz (MHz). Speed is determined by the architecture of the processor - the design that determines how individual components of the CPU are put together on the chip. The architecture of the entire computer system is an important part in the speed equation.
Memory is the work area of the CPU. The information in memory could be program instructions, numbers for arithmetic, codes representing text characters, a part of a picture, or other kinds of data. Each byte has an address that identifies it and helps the CPU keep track of where things are stored. A typical computer has from 16-64 million bytes (16 - 64 megabytes) of memory. The CPU can only see into and access memory. Memory addresses make up the CPU's entire world, so any program that needs to be executed to data that needs to be modified must make its way into memory. Memory is composed of storage cells called bytes. Most computer systems use memory-mapped I/O, where information for input and output are stored in special areas of memory. For example, information to be displayed on the monitor screen is written into a special range of memory addresses that is continually scanned by the video subsystem.
Storage
RAM (random access memory) is a type of primary storage that can be used to store program instructions and data temporarily; the contents of RAM can be changed. Volatile memory.
ROM (read-only memory) is a type of memory containing unchangeable information that serves as reference material for the CPU as it executes program instructions. Non-volatile memory.
Monitor is a computer display device that allows the user to view information on a screen and also serves as an output device for receiving messages from the computer.
Disk drives, tape drives, CD-ROM or CD-R or CD-RW drives. Computer devices for storing data or for entering data into the computer.

2.1.4 Analyze the information concerning the hardware requirements necessary to run software packages.

Certain software packages require appropriate requirements from the hardware

- Speed and type of CPU
- Memory requirements
- Operating system
- Graphics and sound
- Monitor resolution
- CD, disk drives, hard drive space

2.1.5 Explain "good practice" including making regular file saves and back-ups, caring for the computer and diskettes, password protection and general computer security.

Since RAM is not a permanent storage medium, it's important to regularly save your work - that is make a disk file containing your work in progress. That way if the power fails, or if the computer fails, or if you accidentally erase part of your text, you can restart the machine and open the saved version of your document - copy it back from a floppy or hard disk into the computer's memory. If you save your work on a diskette, you can take a break and later return to your computer (or another one at a different location), open your document, and start where you left off.

Your computer should be in an area that is neither too hot, nor too cold. You should keep all magnetic devices away from your computer and your diskettes. Never leave your diskettes in a hot car, or a cold car. Keep diskettes in protective cases too avoid dust coming in contact with the disk. Never touch the disk itself.

You can password protect your computer so that no one but you can gain access to the programs or the data. Most programs will also allow you to password protect individual files in the case of multiple persons using one computer.

2.1.6 Discuss three ergonomic and/or possible health issues arising from the use of computers for extended periods of time, including repetitive strain injury (RSI) and radiation.

Along with the benefits of computer technology comes the potential for unwelcome side effects. For people who work long hours with computers, the side effects include risks to health and safety due to radiation emissions, repetitive-stress injuries, or other computer-related health problems. Inconclusive evidence suggests that low-level radiation emitted by video display terminals and other equipment might cause health problems, including miscarriages in pregnant women and leukemia (58).

2.1.7 Discuss the social significance of, and ethical considerations arising from, the greater dependence on computers in institutions/organizations, including loss of jobs, training and retraining.

Computers are gradually making an incredible impact on our society.
Today computers can perform surgery, fix satellites, and even teach a class. There is very little that a computer cannot do. This creates social problems including the loss of jobs. If the computers are performing these deeds, what are the teachers going to do? They are now out of work while students are learning from computers and computer programs. There are several other impacts that computers have on our society as well including, psychological, ergonomic, political and cultural aspects.

2.1.8 Discuss three environmental concerns associated with computers including energy consumption and hardware disposal.

Computer aren't biodegradable. Energy requirements to run, manufacture, and dispose of computers. Raw materials and toxic materials such as toner and ink cartridges. Disposal of packaging.

2.2 Input and Output

2.2.1 Outline one function of each of any six input-only devices including mouse, CD-ROMs, scanners, microphones, and digital cameras.

I. Mouse
   A. Sends commands and positions cursor.
   B. Designed to move a pointer around the screen and point to specific characters or objects.
II. CD-ROMs
   A. Data disks that are physically identical to musical compact disks.
   B. Can hold the contents of an encyclopedia, including pictures, with room to spare for sound and video clips.
III. Scanners
   A. An input device that can make a digital representation of any printed image.
   B. Flatbed scanners work like a photocopy machine.
   C. Sheet-fed scanners sit between your keyboard and monitor.
IV. Digital Camera
   A. Captures snapshots of the real world as digital images.
   B. It can record anything that a normal camera can.
   C. Stores bit patterns on disks or other digital storage media.
V. Microphones
   A. Allow input of voice into various programs
   B. Allows for voice to text

2.2.2 Outline one function of each of any six output-only devices including printers, speakers, LCD panels, plotters, and VR goggles.

I. Printers (p. 56)
   A. Allows a computer to produce a hard copy on paper of any information that can be displayed on the computer's screen.
   B. Two basic groups.
      1. Impact
         a. line printers; dot matrix printers
         b. form images by physically striking paper, ribbon, and print hammer together the way a typewriter does
      2. Non-impact printers
         a. laser printers
         b. ink-jet printers
II. Speakers
III. LCD panels
   A. Liquid crystal display
   B. Example: the screen of your calculator or the screen on a laptop
IV. Plotters
   A. Automated drawing tool that can produce finely scaled drawings by moving the pen and/or

paper in response to computer commands.
B. Used more often for scientific and engineering applications.

V. VR goggles (Virtual reality goggles)

2.2.3 Outline five hardware tools that can act both as input and output devices including hard drives, tape drives, sound cards, and recordable CD-ROMs.

I. Hard disk
   A. rigid, magnetically sensitive disk that spins rapidly and continuously inside the computer chassis or in a separate box connected to the computer housing.
   B. Information can be transferred quickly to and from a hard disk much faster than a diskette.

II. Sound cards
   A. on IBM-compatible computer multi-media computers are built-in synthesizers that are included in sound cards along with other audio hardware.
   B. Synthesizers are specially designed to generate sounds electronically.

III. CD-ROMs
   A. WORM (write once, read many)
   B. They can write digital information onto blank optical disks, but they can't erase the information once it's burned in.

2.2.3 Explain three modifications to IT devices that are made to give physically impaired people greater accessibility to them.

Digitized voice input, like scanned text, must be processed by sophisticated software before it can be interpreted by the computer as words. Automatic speech recognition techniques similar to those used by vision and OCR systems, including segmentation of input and sound patterns into individual words and phonemes; expert rules for interpreting sounds; context "experts" for dealing with ambiguous sounds; and learning from a human trainer.
Speech synthesis software or hardware, modern desktop computers can generate synthetic speech by converting text into phonetic sounds. Most of today's speech synthesizers sound artificial; human spoken language is complex, and no one has come close to duplicating it with software.

2.3 Storage

2.3.1 Discuss one advantage and one disadvantage of common storage devices including hard drives, diskettes, CD-ROMs and magnetic tapes.

Most computer users are familiar with the diskette (or floppy disk), a small magnetically sensitive, flexible plastic wafer housed in a plastic case. Most personal computers include at least one disk drive that allows the computer to write and read from diskettes. As a result, diskettes are an almost universal currency for transferring information between machines and for packaging commercial software. Diskettes are inexpensive, convenient, and reliable, but they lack the storage capacity and drive speed for many large jobs. Most users rely on hard disks as their primary storage devices. A hard disk might hold hundreds or thousands of megabytes of information. Information can be transferred quickly to and from a hard disk much faster than with a diskette.
CD-ROM (compact disk read-only memory) drives are optical drives capable of reading CD-ROMs, data disks that are physically identical to musical compact discs.

2.4 Software

2.4.1 Define software.

Software is the set of instructions that tell the computer what to do.

2.4.2 Outline the differences between freeware, public domain, shareware, and proprietary/commercial software.

I. Public Domain
   A. software that is free for the taking
   B. can be legally copied and shared

II. Shareware
   A. software free for the trying with a send payment if you keep it honor system
   B. can be legally copied and shared.

2.4.3 Describe integrated software

A program that includes several applications designed to work well together. The integrated software package usually includes: word processing, database, spreadsheet, graphics, and telecommunications. Examples are Microsoft Works and Claris Works.

2.4.4 Describe the paper documents that are commonly found in software packages: user manual, registration card, warranty, and copyright agreement.

- **User manual:** instructions on how to use the software, including installation instructions and troubleshooting.
- **Registration card:** to register your software by mail
- **Warranty:** statement of what the software is supposed to do
- **Copyright agreement:** statement that the software is copyrighted and may be use on only one computer and not copied.

2.4.5 Explain two features of a software user interface that makes it user friendly, including the use of visual metaphors of the real world.

- **Window:** a framed area on the computer screen that can be opened, closed and moved with a pointing device.
- **Icon:** a picture that represents the files, disks and other items in a graphical user interface (GUI)
- **Pull down menu:** a menu that allows the user to select a command by pulling down the list of choices from the menu title using a pointing device such as a mouse.

2.4.6 Outline two factors that need to be considered, other than hardware requirements, when installing software onto a personal computer.

- **Compatibility:** the matching of hardware and software so they can work together properly. Software and peripherals are described in terms of whether they can work with particular computers and operating systems, and with each other.
- **Capacity:** memory and external storage capacity are sufficient

2.4.7 Outline three factors that need to be considered when installing software onto a network, including hardware requirements.

- Site licenses need to be acquired if there are a certain amount of computers on the network. Network licenses are also available for some software packages. Make sure you have enough licenses to cover all computers on your network.
- The individual computers that are connected to the server must be able to run the program that the server is running.
- Make sure licenses are issued to each computer so those computers don't crash when running software.

2.4.8 Evaluate two ways in which individuals can be trained to use new software.

- Read the manual and use the tutorial that usually comes along with the software.
- Attend a class that explains the basics of the software.

2.4.9 Define interface.

A boundary between two systems; in IT, machines and/or humans communicate across these boundaries. An interface may be as simple as a hardware connector. It may include communication protocols or programs and features by which humans enter commands into and receive information from machines.

2.4.10 Define computer-human interface.

The devices and software that enable people to use computers. These include physical devices such as a mouse, keyboard, pointers and light wands. They also include software, such as Microsoft Windows, with icons, help dialogues, and wizards.

2.4.11 Discuss reasons for the evolution in the designs of interfaces, from command-line based to graphically based interfaces. (GUIs) (pg. 90)

Using graphically based interfaces is easier because it allows new users to be up and running in a fraction of the time it takes to learn a command-line system.

2.4.12 Describe four features of GUIs including pull-down menus, icons and pointing devices.

- Pull-down menu is a menu that allows the user to select a command by "pulling down" the list of choices from the menu title using a pointing device such as a mouse.
- Icon is a picture that represents files, disks and other items.
- Mouse is a hand-held device for moving the cursor and for pointing on computer monitors. The device may have one or two keys that, when pressed, will cause objects under the cursor to be selected or activated.
- Window is a framed area on the computer screen that can be opened, closed, and moved with a pointing device.

2.4.13 Suggest three features that could be characteristic of future interfaces. (pg. 93)

- Natural language interface: allows the computer to understand in various languages. It will comprehend commands given in the natural language of the user whether written or spoken.

- Virtual realities: a user interface that looks to the user like an artificial world.
- Agents: a futuristic intelligent software entity that "lives" in a computer and acts as a digital secretary. An agent can anticipate user requests, fill in details in the user's work, and adjust the computerized workspace to fill the user's needs.

2.4.14 Suggest three characteristics of a computer-user interface designed for a person who has special needs.

- Voice recognition
- Mouth wands
- Foot pedals

2.4.15 Identify types of software appropriate to specified tasks.

- Word processor: A program used to create and print (mainly text) documents that might otherwise be prepared on a typewriter. The key advantage is the ability to make changes easily, such as correcting spelling, changing margins, or adding, deleting and relocating entire blocks of text. Once created, the document can be printed quickly and accurately and saved for later modification.
- Database: One of more large structured sets of persistent data, usually associated with software to update and query the data. A simple database might be a single file containing many records, each of which contains the same sets of fields where each field is a certain fixed width.
- Spreadsheet: types of application programs which manipulate numerical and string data in rows and columns of cells. The value in a cell can be calculated from a formula, which can involve other cells. A value is recalculated automatically whenever a value on which it depends, changes. Different cells may be displayed with different formats.
- Multimedia: Human-computer interaction involving text, graphics, voice and video. Often also includes concepts from hypertext.
- Modeling: A description of observed behavior, simplified by ignoring certain details. Models allow complex systems to be understood and they behavior predicted within the scope of the model, but may give incorrect descriptions and predictions for situations outside the realm of their intended us. A model may be used as the basis for a simulation.
- Computer Aided Design: The part of CAE concerning the drawing or physical layout steps of engineering design.
- Computer Aided Engineering: Use of computers to help with all phases of engineering design work. Like CAD, but also involves the conceptual and analytical design steps.
- Desktop publishing: Using computers to lay out text and graphics for printing in magazines, newsletters, brochures, etc. A good DTP system will provide, among other things, facilities to fit text into irregular shapes in a variety of fonts and sizes.

2.4.16 Evaluate the use of paper documentation, on-line documentation and integrated help menus.

On-line documentation relies on your having access to the Internet to access that information. Paper documentation (users manuals) are a good source of information, but can be cumbersome to store, etc. Integrated help menus give you help directly inside the program you are using when you need it.

2.4.17 Define bug. (pg. 70)

An unwanted and unintended property of a program or piece of hardware, especially one that causes it to malfunction. Antonym of feature. E.g. "There's a bug in the editor: it writes things out backwards." The identification and removal of bugs in a program is called "debugging".

Admiral Grace Hopper (an early computing pioneer better known for inventing COBOL) liked to tell a story in which a technician solved a glitch in the Harvard Mark II machine by pulling an actual insect out from between the contacts of one of its relays, and she subsequently promulgated bug in its hackish sense as a joke about the incident (though, as she was careful to admit, she was not there when it happened). For many years the logbook associated with the incident and the actual bug in question (a moth) sat in a display case at the Naval Surface Warfare Center (NSWC). The entire story, with a picture of the logbook and the moth taped into it, is recorded in the "Annals of the History of Computing", Vol. 3, No. 3 (July 1981), pp. 285--286.

The text of the log entry (from September 9, 1947), reads "1545 Relay #70 Panel F (moth) in relay. First actual case of bug being found". This wording establishes that the term was already in use at the time in its current specific sense - and Hopper herself reports that the term "bug" was regularly applied to problems in radar electronics during WWII.

Indeed, the use of "bug" to mean an industrial defect was already established in Thomas Edison's time, and a more specific and rather modern use can be found in an electrical handbook from 1896 ("Hawkin's New Catechism of Electricity", Theo. Audel & Co.) which says: "The term "bug" is used to a limited extent to designate any fault or trouble in the connections or working of electric apparatus." It further notes that the term is "said to have originated in quadruplex telegraphy and have been transferred to all electric apparatus."

The latter observation may explain a common folk etymology of the term; that it came from telephone company usage, in which "bugs in a telephone cable" were blamed for noisy lines. Though this derivation seems to be mistaken, it may well be a distorted memory of a joke first current among *telegraph* operators more than a century ago! A

ctually, use of "bug" in the general sense of a disruptive event goes back to Shakespeare! In the first edition of Samuel Johnson's dictionary one meaning of "bug" is "A frightful object; a walking spectre"; this is traced to "bugbear", a Welsh term for a variety of mythological monster which (to complete the circle) has recently been reintroduced into the popular lexicon through fantasy role-playing games.

In any case, in jargon the word almost never refers to insects.

2.4.18 Discuss the ethical considerations involved with software.

- Copyright issues
- Licensing

2.5 Operating Systems and Utilities

2.5.1 Outline the functions of an operating system including communications with input and output devices, concurrent processing and multitasking, program and data management.

- Control the machine
- Monitor system activities
- Perform maintenance tasks
- Communicating with peripherals
- Coordinating concurrent processing of jobs
- Memory management
- Resource monitoring, accounting and security
- Program and data management

2.5.2 State at least two different operating systems found in personal computers.

- **Disk operating system:** The name of a number of operating systems, which include facilities for storing files on disks. Such a system must hand physical disk I/O, the mapping of file names to disk addresses and protection of files from unauthorized access (in a multi-user system). A DOS should present a uniform interface to different storage devices such as floppy disks, hard disks and magnetic tape drives. It may also provide some kind of locking to prevent unintentional simultaneous access by two processes to the same file or record.
- **Windows:** Microsoft's 32 bit operating system developed from what was originally intended to be OS/2 3.0 before Microsoft and IBM ceased joint development of OS/2. NT was designed for high-end workstations (Windows NT Workstation), servers (Windows NT Server) and corporate networks.

2.5.3 Explain why the "boot up" system is stored in memory (ROM) of a computer.

The parts of the operating system that are stored in ROM are those needed to being the process of booting up and loading the remainder of the system software to memory.

2.5.4 Outline four types of utility programs, including one function of each.

- **Disk defragmenter:** rearranges the data on your disk for faster access.
- **Backup software:** allows you to backup your entire drive, parts of the drive or specific data to disk or tape.
- **Unerase software:** allows you to find a file or files that you have accidentally deleted from your drive and recover those files.
- **Disk repair software:** allows you to fix errors on your disks.

2.5.5 Explain why a disk defragmenting utility program should be run frequently.

A disk defragmenting utility program should be run frequently because it makes your disks run faster. When the program is run frequently, it moves all of the information to one space and makes room for the empty space. Utility programs serve as tools for doing system maintenance, and some repairs that are not automatically handled by the operating system. They make it easier for users to copy files between storage devises, to repair damaged data files, to translate files so that different programs can read them, and to guard against viruses and other potentially harmful programs.

2.5.6 Describe how to make a back-up.

Use a back-up program or save your information to a disk or tape drive.

2.5.7 Explain two different situations when back-ups should be made frequently.

- Data is critical to operations of your business. Back-ups should be made daily and one set of back-ups should be stored off-sight of your business in case of fire, flood, break-in, etc.
- Changes are being made to data. New back-ups should be made of any data that has been changed since the last backup.

2.5.8 Compare the advantages and disadvantages of three types of peripherals that are used for back-ups including tape drives and hard disk.

Tape drives are common storage devices in most mainframe computers and some personal computers. It is used because it can store massive amounts of information at relatively low cost. Its disadvantage is that it is a sequential access medium. It is very time consuming to retrieve information from the middle of a tape.
The magnetic disk is used for storage and has random access capability. Most computer users have a diskette or a floppy disk, a small magnetically sensitive, flexible plastic wafer housed in plastic case. A hard disk is a rigid magnetically sensitive disk that spins rapidly and continuously inside the computer chassis.
An optical disk drive uses laser beams rather than magnets to read and write bits of information on the disk's surface. The are not as fast as magnetic hard disks, but they have considerably more room for storing data.

2.5.9 Describe the difference between a virus, Trojan horse, worm, and logic bomb.

A virus is a program that spreads from program to program, or from disk to disk, and uses each infected program or disk to make more copies of itself. A Trojan horse is a program that performs a useful task while at the same time carries out some secret destructive act. A worm is a virus-like program that travels over computer networks, seeking out uninfected work stations to occupy. A logic bomb is a type of trojan horse that is programmed to attack in response to a particular logical event or sequence of events.

VIRUS: A program that infects a computer by atttaching itself to another program, and propagating itself when that program is executed.A computer can become infected by files downloaded over a network, or by the installation of new software or floppy disks that are infected with viruses.Some viruses are only pranks, and perform harmless actions like displaying a screen with a joke message on it.Others can destroy files or wipe out a hard drive.

TROJAN HORSE: A program that appears to be useful and harmless but which has harmful side effects such as destroying data or breaking security on the system on which it is run.It is similar to a virus except that it does not propagate itself as a virus does.

WORM: A computer program that can make copies of itself, and spreads through connected systems, using up resources in affected computers or causing other damage.

LOGIC BOMB: Code that is hidden in a program or system which will cause something to happen when the user performs a certain action or when certain conditions are met.A logic bomb, which can be

downloaded along with a corrupted shareware or freeware program, may destroy data, violate system security, or erase the hard disk.It is not the same as a virus because the logic bomb executes once, or at periodic intervals, whereas the action of a virus is ongoing.

2.5.10 Describe three ways a virus program can infect a standalone personal computer.

- Can be transmitted from computer to computer via floppy disks.
- Can be downloaded with software.
- Can be passed through a network.

2.5.11 Describe two common ways in which a user can be alerted to the presence of a virus.

Some common ways in which a user can be alerted to the presence of a virus are the virus may display an unexpected message, gobble up memory, destroy data files, or cause serious errors.
A resident virus scanner that resides in memory and checks incoming files and changes to memory is also useful in detecting the presence of viruses.

2.5.12 Outline the purpose of a disk recovery program.

The purpose of a disk recovery program is mainly to recover or retrieve information from disks that may have been damaged for whatever reason.

2.5.13 Predict the possible economic, political and psychological consequences arising from a community being infected with computer viruses.

A community being infected with computer viruses would be severely damaged. Their personal computers might be destroyed affecting the individuals. Computer viruses could destroy all records of the community and possibly the banking system. This would cause an economic destruction of finances. People's whole lives could be erased by the destruction of a community's computers through viruses. This would have profound psychological impact.

2.5.14 Describe three ways in data can be kept secure.

- Back up your information on a secondary storage medium
- Protect your disks by keeping them away from liquids, dust, pets, and especially magnets.
- If you are using a password-protected system, take your password seriously

2.5.15 State four features of a good password.

- One that is not easy to guess
- Ones where hackers can't use dictionary software to guess them
- One that is changed frequently
- Contains both numeric and alpha characters
-

2.5.16 Explain two ways in which this password can be kept secure

- Do not share your password with <u>anyone</u>
- Use a call-back system

2.5.17 Describe three security systems that use computer technologies to prevent unauthorized access by people to a building.

- An alarm system
- A motion detector
- A laser motion sensor

2.6 Word Processing and Desktop Publishing

2.6.1 Define *word processing.*

A software application that allows text documents to be edited and formatted on screen before being printed.

2.6.2 List three font formatting functions that can be carried out be most word processors.

- bold
- italicized
- underlined

2.6.3 Describe one efficient method of changing a word-processed document that is A4 formatted so that it fits legal-sized paper.

You can define style sheets containing custom styles for each of the command elements in a document.

2.6.4 Define *white space.*

Space where there is nothing.

2.6.5 Define *ASCII*.

American standard code for information interchange. The most widely used code for representing characters in computer memory. ACSII represents each character as a unique 8-bit code .

2.6.6 Define *text format.*

Defines the type faces, margins, spacing, layout, and other features that effect the appearance of a document.

2.6.7 State how the number of bytes equates to the number of characters.

8 bits is equal to 1 byte. A byte is one character.

2.6.8 State how the number of bits equates to the number of bytes.

8 bits is equal to one byte.

2.6.9 Outline two errors in a text that would be corrected by a spelling checker.

- A misspelled word
- Incorrect grammar

2.6.10 Explain two errors that would not be corrected or detected by a spelling checker.

- Homonyms (there, their, they're)
- Missing words in a sentence

2.6.11 State two examples of text that, although correct, would be "flagged" as errors by a spelling checker.

- Scientific terms that the computer does not recognize
- Words in another language

2.6.12 Explain the functions of a thesaurus.

To find synonyms or antonyms of a word

2.6.13 Discuss at least two ethical considerations that can arise from the use of spelling checkers and grammar checkers.

- It would provide an unfair advantage to those who do not have spelling or grammar checkers.
- Using a grammar checker or spelling checker causes people to rely on them rather than their own knowledge.

2.6.14 Outline how OCR software can "input" a text document into a word processor.

Optical character recognition is accomplished by a specialized combination of software and hardware. A scanner first senses and digitizes the printed image into binary form. The OCR software then converts the bit stream into words and sentences by using the spaces and punctuation of the original written text.

2.6.15 Discuss the requirements necessary before a paperless society could exist.

- All previous records would have to be converted from paper and stored in computers and in secondary storage media form.
- Everyone in that society would have to be technologically educated.
- Have a major back-up system in case of any type of system failure.

2.6.16 Suggest the ways in which a computer could be modified so that a person with no arms could use a word processor.

- An automatic speech recognition system could be installed.
- The person could use a special devise operated by their mouth or feet.

2.6.17 Describe two pieces of additional hardware, beyond what is normally required for a word processor, necessary to support DTP.

- A scanner could be used for input
- A large high resolution screen would make the graphic images in desktop publishing easier to see.

2.6.18 Explain the importance of high resolution printers for DTP.

High resolution printers help make what is printed clearer and easier to see, and since much of it is graphics, it makes them more distinctive.

2.6.19 Compare a total of three advantages and/or disadvantages of a word processor with those of a DTP package.

- One advantage is that desktop publishing saves money.
- Desktop publishing saves time.
- Desktop publishing reduces the number of errors.

2.6.20 Compare three advantages and/or disadvantages of using DTP to publish (print) a given document with using the services of a commercial printer.

Advantages:

- Saves money
- More internal control over document
- Less time from start of project to finished product

Disadvantages:

- Staff needs to know DTP programs
- Need for special printers (color, large paper formats)

2.6.21 Design a publication using DTP (use Pagemaker)

2.6.22 Describe the historical development of DTP

The world of publishing was radically transformed in the 1980's with the intro of desktop publishing. It came equipped with graphics and DTP programs, and accelerated with the availability of laser printers. (**page 112 of <u>Computer Confluence</u>)**

2.6.23 Define *intellectual property*

Intellectual property is a legal category that includes the rights to the results of intellectual activities in the arts, sciences and industry.

2.6.24 Define *copyright*

Copyright is the moral and economic rights of those who produce scientific, literary or artistic works. These rights are protected by national legislation and through international conventions. IN 1996 the World Intellectual Property Organization (WIPO) adopted two treaties on copyright, performances and phonograms that extend these rights to works disseminated in digital format.

2.6.25 Suggest possible legal and economic consequences arising from copyright intellectual property by scanning, and from extracting from printed materials.

People who commit this crime could be fined, an economic consequence, or be sentenced to serve time in jail, a legal consequence. Intellectual property is information, such as books, magazine articles, and information on the Internet, that has been copyrighted. Students may use this information as long as it is cited using an acceptable bibliographic form.

2.6.26 Discuss the ethical considerations arising from the copying of intellectual property.

Some ethical considerations are that: copying of intellectual property is wrong because it is illegal and dishonest. Copying of intellectual property is stealing the work of another person. It goes against the morals of the general public.

2.7 Graphics

2.7.1 Define pixel.

A pixel is a picture element; a single dot on a monitor or printed document. It is the smallest rectangular area of an image that can be manipulated on a monitor or printer, or stored in memory. The simplest pixel is a black and white unit that is either white or black.

2.7.2 Explain how 8 bits per pixel can produce 256 shades of gray color.

If 8 bits are used to describe a pixel, its brightness can range from 0 to 255 and shades of gray or colors can be represented. In color images the data describing the pixels has both brightness and color information. Pixels of 24 bits can represent millions of colors.

2.7.3 List five formats for storing a graphical image including BMP, GIF, and JPG

- BMP
- GIF
- JPG (or JPEG)
- TIF (or TIFF)
- WPG
- PIC
- PIX

2.7.4 Outline the difference between bitmapped and vector graphics with respect to the appearance, editing, storage and transmission of images.

I. Bit-mapped graphics
   A. Painting programs create bit-mapped graphics, or pictures that are to the computer, simple maps showing how the pixels on the screen should represented.
   B. Higher-quality pictures can be produced by allocating more memory per pixel, so each can display more possible colors or shades.

II. Vector graphics
   A. Pictures are collections of lines, shapes, and other objects, this approach is called vector graphics.
   B. Many drawing tools-lines, shapes, and text tools- are similar to painting tools in bit-mapped programs. But the user can manipulate objects and edit text without affecting neighboring objects, even if the neighboring objects overlap. This method when printed out has a much smoother look .

2.7.5 Evaluate the implications of the appearance, and of the storage of images, with different degrees of color.

The more colors an image contains, the crisper and clearer it is. However, an image that contains many colors is harder to store. A colorful image will most likely be 32 megabytes, rather than 16 megabytes, which requires more memory to store.

2.7.6 Compare the quality of graphics necessary for output to a monitor and to a laser printer.

The better the resolution of the monitor, the better the quality of the graphic. The better the quality of the graphic on the monitor, the better the quality of the graphic when printed by the laser printer.

2.7.7 Describe an efficient method of getting a colored picture from a book into a computer system.

A scanner is an efficient method of getting a colored picture from a book into a computer system. A scanner is an input device that can make digital representation of any printed image.

2.7.8 Discuss three methods that could be used to take a photograph and input the image into a computer, including the use of a digital camera and a photograph on a CD-ROM.

A digital camera can be used to capture snapshots of the real world as digital images. Unlike a scanner, a digital camera isn't limited to capturing flat printed images; it can record anything that a normal camera can.

Video digitizers, stored on CD-ROM, allow you to capture analog video images as digital data that can be stored and manipulated in the computer's memory.

A third method is scanning a photograph. A scanner makes a digital representation of a printed image.

2.7.9 Define *computer-aided design* (CAD)

Computer-aided design is the use of computers to design products. CAD software allows engineers, designers, and architects to create designs on screen for products ranging from computer chips to buildings.

2.7.10 Describe two advantages and two disadvantages of using CAD instead of traditional drawing methods such as freehand.

I. Two advantages of using CAD
   A. Using CAD an engineer can crash-test a new model of an automobile before it ever leaves the computer screen.
   B. CAD tends to be cheaper, faster, and more accurate than traditional design-by-hand techniques.

II. Two disadvantages of using CAD
   A. The picture that you need may not be available on CAD.
   B. Using CAD could be very difficult; various skills may be required.

2.7.11 Describe two examples of design situations that employ IT.

IT is used for designing buildings, automobiles, airplanes, etc.

2.7.12 Discuss the ethical issues involved in storing art work in electronic form.

Artists and art viewers may disagree that true art can be made by a computers, they consider it fabricated. Another reason is because if people scan pictures made by various artists they need to post a copyright stating that they have the right to post this artwork. Works created on computer could also be manipulated and changed by someone other than the original artist.

2.7 Spreadsheets

2.8.1 Define spreadsheet

An application that processes both numbers and text in rows and columns. Cell values are calculated by formula that can use values or formulas in other cells. Recalculations occur when values changes in dependent cells. Spreadsheets may include three dimensional cell references (references to cells in another "layer" of the spreadsheet). Spreadsheets are useful in conducting "what if "explorations.

2.8.2 Outline the components of a spreadsheet including rows, columns, formulas, formatting, and macros.

I. Rows- Spaces that are able to be filled in horizontally
II. Columns- Vertical spaces on the spreadsheet
III. Formulas- A step by step procedure for calculating a desired number
IV. Formatting- Adjusting the spreadsheet so that it contains the correct number of columns and rows.
V. Macros-Custom designed procedures that you can add to the existing number of options that automates repetitive tasks.

2.8.3 Outline the major developments of spreadsheets from VisiCalc to modern spreadsheet software.

I. 1-2-3
   A. Integrated spreadsheet/graphics package
   B. Quickly established itself as the standard spreadsheet on IBM-compatible computers.

II. Microsoft Excel

A. A graphical spreadsheet program
B. Developed first for Macintosh and later for Windows
C. Incorporated AI

III. VisiCalc (discontinued program)
A. First commercial spreadsheet program
B. Not graphical

2.8.4 Apply equations in spreadsheets to solve common problems including the process of addition, subtraction, multiplication, division and the calculation of totals, means, and character manipulation.

2.8.5 Predict the outcomes of changing the contents of cells in spreadsheets and the results obtained if given a simple spreadsheet formula.

If the contents of cells in spreadsheets are changed the results will either be increased or decreased, depending on the changes made. This is true if the spreadsheet deals with numerical values.

2.8.6 Suggest two possible future developments in spreadsheet software.

Microsoft Excel and other spreadsheets are beginning to incorporate artificial intelligence to guide users through complex procedures. Future spreadsheets are likely to include validators, the equivalent of spelling and grammar checkers for spreadsheets. In the future spreadsheets may disappear into the background along with other applications. Users will work with words, numbers and other types of data without having to think about separate word processors, spreadsheets, and other applications. The focus will be more on the data than the tools.

2.8.7 Discuss one situation where spreadsheets have been used to solve problems for each of the following: individuals, communities, and institutions/organizations.

- Household budgeting
- Costs of town maintenance/repair
- Salaries

There are many more situations that you can think of here. You need to be able to discuss how spreadsheets have been used to solve problems for these groups.

2.8.8 Design a spreadsheet to solve a simple problem.

2.8.9 Discuss the possible ethical considerations arising from a total dependence on spreadsheets.

If the calculations of the spreadsheet are not tested the results could be incorrect. An individual relying on the spreadsheet to make an important decision would obviously make the wrong choices. Also, one needs to check for accuracy of the data entered into the spreadsheet. GIGO really applies here. One mistake in a number can change an entire financial picture.

2.9 Modeling and Simulations

2.9.1 Define modeling.

The use of computers to create abstract models of objects, organisms, organizations, and processes.

A description of observed behaviour, simplified by ignoring certain details. Models allow complex systems to be understood and their behaviour predicted within the scope of the model, but may give incorrect descriptions and predictions for situations outside the realm of their intended use. A model may be used as the basis for simulation

2.9.2 Define simulation.

The use of computer models to test hypotheses and make decisions.

Attempting to predict aspects of the behavior of some system by creating an approximate (mathematical) model of it. This can be done by physical modeling, by writing a special-purpose computer program or using a more general simulation package, probably still aimed at a particular kind of simulation (e.g. structural engineering, fluid flow). A typical example is an aircraft flight simulator.

Creating a mathematical model of a real system, to see how the system works and, by changing variables, make predictions about how the system will change.For example, a mathematical simulation of an insect population and its habitat could include such variables as available food supply, natural predators, and rainfall.Changing one of the variables in the simulation would show how the population is affected when that variable changes in the real system.

The process of imitating a real phenomenon with a set of mathematical formulas. Advanced computer programs can simulate weather conditions, chemical reactions, atomic reactions, even biological processes. In theory, any phenomena that can be reduced to mathematical data and equations can be simulated on a computer. In practice, however, simulation is extremely difficult because most natural phenomena are subject to an almost infinite number of influences. One of the tricks to developing useful simulations, therefore, is to determine which are the most important factors.

In addition to imitating processes to see how they behave under different conditions, simulations are also used to test new theories. After creating a theory of causal relationships, the theorist can codify the relationships in the form of a computer program. If the program then behaves in the same way as the real process, there is a good chance that the proposed relationships are correct.

2.9.3 Outline two different ways of doing modeling, including the use of special purpose software.

I. Spreadsheets
II. Simulation software

2.9.4 Describe four situations that use simulation software including flight simulators, and modeling ecological and financial systems. (pg. 136-137)

One situation in which simulation software is useful is in the case of a flight simulator. In a typical flight simulation, the pilot controls the plane's thrust and elevator angle by feeding input data to the model plan. The model responds by adjusting air speed and then angle of ascent of descent, just as a real plane would. The pilot responds to the new state of the aircraft by adjusting one or more of the

controls, which causes the system to respond by revising the aircraft's state again. This feedback loop, where the plane and pilot react to data from each other continues throughout the simulation. A flight simulator might have a graphical user interface that makes the computer screen look and act like the instrument panel of a real plane so that it can be run interactively by human pilots. This is helpful because it helps pilots prepare themselves for emergency situation and lets them know how the plane will react without actually being in the situation.

Modeling ecological systems allow computer scientists and ecologists to attempt to solve a leading concern in today's world. This allows them to test out several different solutions and compare their effects to see which works best.

Modeling financial systems allow people to see how they will work before they are put into place. They can test out different financial procedures and see their effects before making the transactions.

2.9.5 Discuss three benefits and two limitations of models.

Benefits

- Safety: some activities are so dangerous that they are not ethically possible without computer simulations. How, for example, can scientists study the effects of a nuclear power plant meltdown on the surrounding environment? Until a meltdown occurs there is only one practical answer: computer simulation.
- Economic benefits: It is far less expensive for an automobile manufacturer to produce a digital model of a non-existent car than to build a prototype out of steel. The computer model can be tested for strength, handling, and efficiency in a series of simulations before the company builds and tests a physical prototype. The cost of computer modeling is small when compared to the possible expense of producing a defective car.
- Projection: Without computers it could take decades for biologists to determine whether the rising deer population on an island threatens other species, and by the time they discover the answer, it would be too late to do anything about it. A computer model of the island's ecosystem would speed up natural biological processes, so their effect over several generations could be measured in a matter of minutes. A computer simulation can, in effect, serve as a time machine for exploring one of more possible futures.
- Visualization: Computer models make visualization possible, and visualization allows researchers and students to see and understand relationships that might otherwise go unnoticed. Computer models can speed time up or slow it down, they can make subatomic particles big and the universe small.
- Replication: In the real world it can be difficult or impossible to repeat a research project with slightly different conditions. This kind of repetition is an important part of serious research. An engineer needs to fine-tune dimensions and angles to achieve peak performance. A scientist studies the results of one experiment and develops a new hypothesis that calls for further testing. An executive needs to test a business plan under a variety of economic scenarios. If the research is conducted on a computer model, replication is just a matter of changing input values and running a new simulation.

Limitations:

- GIGO: The accuracy of a simulation depends on how closely its mathematical model corresponds to the system being simulated. Mathematical models are built on assumptions, many of which are difficult or impossible to verify. Some models suffer from faulty assumptions; other contain hidden

assumptions that may not even be obvious to their creators; still others go astray simply because of clerical or human errors.

- Making reality fit the machine: It is not yet possible to run simulations on personal computers. Even Apple and other manufacturers of personal computers need to use supercomputers to run simulations. Some simulations are so complex that researchers need to simplify models and streamline calculations to get them to run on the best hardware available. Researchers face a constant temptation to reshape reality for the convenience of the simulation. Sometimes this simplification of reality is deliberate; more often it is unconscious. Either way, information can be lost, and the loss may compromise the integrity of the simulation and call the results into question. Illusion of infallibility: Risks can be magnified because people take computer seriously. For many people information takes on the air of respectability if it comes from a computer. Computer-generated reports tend to be emphasized, often at the expense of other sources of knowledge. Many people are placing their trust in computer simulations. Many of them trust the data precisely because a computer generated it. A computer simulation, whether generated by a PC spreadsheet or churned out by a supercomputer, can be an invaluable decision making tool. The risk is that the people who make decisions with computers will turn over too much of their decision making power to the computer.

2.10 Databases

2.10.1 Define database

A collection of information stored in an organized form in a computer.

One or more large structured sets of persistent data, usually associated with software to update and query the data. A simple database might be a single file containing many records, each of which contains the same set of fields where each field is a certain fixed width.

A database is one component of a database management system.

1.A large collection of data organized for rapid search and retrieval.

2.A program that manages data, and can be used to store, retrieve, and sort information.Some database programs are Lotus Approach, Microsoft Access, Filemaker, and dBASE.

A collection of information organized in such a way that a computer program can quickly select desired pieces of data. You can think of a database as an electronic filing system.

Traditional databases are organized by *fields*, *records*, and *files*. A field is a single piece of information; a record is one complete set of fields; and a file is a collection of records. For example, a telephone book is analogous to a file. It contains a list of records, each of which consists of three fields: name, address, and telephone number.

An alternative concept in database design is known as *Hypertext*. In a Hypertext database, any object, whether it be a piece of text, a picture, or a film, can be linked to any other object. Hypertext databases are particularly useful for organizing large amounts of disparate information, but they are not designed for numerical analysis.

To access information from a database, you need a *database management system (DBMS)*. This is a collection of programs that enables you to enter, organize, and select data in a database.

Increasingly, the term *database* is used as shorthand for *database management system.*

2.10.2 Define file

An organized collection of information, such as a term paper or a set of names and addresses, stored in the form the computer can read. In a database, a file is a collection of records.

2.10.3 Define record

A collection of related information in a database file. Typically the information relating to one person, product, or event.

2.10.4 Define field

An individual component of a database or hypermedia record. For example, First Name, Last Name, and Phone might be fields in a telephone directory database.

2.10.5 Describe the structure of a database

A database is a collection of information stored in an organized form in a computer, and a database program is a software tool for organizing storage and retrieval of that information. A database is composed of one or more files. A file is a collection of related information; it keeps that information together the way a drawer in a file cabinet does. A file is a part of a database, a specific kind of file. A database file is a collection of records. A record is the information relating to one person, product or event. Each discrete chunk of information in a record is called a field. A record in the library's card catalog database would contain fields for author, title, and publisher, address, date and title code number. Its field type determines the type of information a field can hold. For example, the author field in the library database would be defined as a text field, so it could contain text. A numeric field could contain only numbers; a date field could contain only dates. A computed field contains formulas similar to spreadsheet formulas; they display values calculated from values in other numeric fields. Most database programs provide you with more than one way to view the date, including form views that show one record at a time and list views that display several records in lists similar to a spreadsheet.

2.10.6 Outline one application where it is most appropriate to use each of the following types of database: flat-file, relational and programmable. (pg. 181 and 191-192)

1. Flat file
   - A. Used when the information is related
   - B. Collection of records

11. Relational
   - A. Organized so that information is duplicated in several different files.
   - B. If change is made to one file, change will be made in all.
   - C. Student ID file is an example.

2.10.7 Compare the structure and functions of spreadsheets and databases.

Spreadsheets allow the user to take control of numbers, manipulating them in ways that would be difficult or impossible otherwise. A spreadsheet document, called a worksheet, typically appears on the screen as a grid of numbered rows and alphabetically lettered columns. The box, called a cell, represents the intersection of a row number and column letter. All the cells are empty in a new worksheet, it's up to the user to fill them. Each cell can contain a numeric value, an alphabetical label, or a formula representing a relationship between numbers in other cells. Values (numbers) are the raw material used by the spreadsheet software to perform calculations. Most worksheets include labels at the tops of columns and at the edges of rows. To the computer, these labels are meaningless strings of characters. To calculate the total points the worksheet must include a formula, a step-by-step procedure for calculating the desired number. (pg. 124) Databases are information managers that can help alleviate information overload. Databases make it possible for people to store, organize, retrieve, communicate, and manage information. A database is a collection of information stored in an organized form in a computer, and a database program is a software tool for organizing storage and retrieval of information. A database is composed of one or more files. A file is a collection of related information; it keeps that information together the way a drawer in a file cabinet does. A file is a part of a database, a specific kind of file. A database file is a collection of records. A record is the information relating to one person, product or event. Each discrete chunk of information in record is called a field. A record in the library's card catalog database would contain fields for author, title, publisher, address, date and title code number. The type of information a field can hold is determined by its field type. For example, the author field in the library database would be defined as a text field, so it could contain text. A numeric field could contain only numbers; a date field could contain only dates. A computed field contains formulas similar to spreadsheet formulas; they display values calculated from values in other numeric fields. Most database programs provide you with more than one way to view the data, including form views that show one record at a time and list views that display several records in lists similar to a spreadsheet.

2.10.8 Define database management system (DBMS).

A program or system of programs that can manipulate data in a large collection of files, cross referencing between files as needed.

2.10.9 Outline the functions of a database management system including queries, sorts, reports and maintenance.

1. Functions of a database management system
    - A. Database queries
        1. Asking the database for specific information
        2. An information request is called a query
            - a. may be a simple search for a specific record
            - b. may be a request to select all the records that match a set of criteria
        3. Once a group of records is selected, one can browse through it, produce a printout, or do just about anything else one might do with the complete file.
    - B. Sorting Data
        1. Rearranging records to make the most efficient use of data
        2. A sort command allows one to arrange records in alphabetic or numeric order based on values in one or more fields.
    - C. Printing reports, labels and form letters
        1. Can produce a variety of printouts
        2. Report

a. most common type of database printout
b. an ordered list of selected records and fields in an easy to read form

3. Can be used to produce mailing labels and customized form letters.
   a. many database programs do no actually print letters
   b. they export data or transmit the necessary records and fields to word processors with mail merge capabilities, which then take on the task of printing the letters.

2.10.10 Design a database with at least six fields.

Students should be able to design a simple database using text, and numerical and date fields. For example, students often confuse entering a telephone number in a text field with entering it in a numerical field because a telephone number contains digits.

2.10.11 Compare three advantages and three disadvantages of paper files with electronic files.

Paper files: Advantages: Cannot be easily lost or deleted; easy to find; can store all in one location Disadvantages: Can burn or be lost in other disasters; wastes paper; takes up more space Electronic files: Advantages: Can be saved and backed up, portable; easy to change or delete information; saves space Disadvantages: Can be infected with virus; hardware problems can interfere with retrieval; might need multiple disks; easier to destroy

2.10.12 Explain how databases can be used to solve two problems, including one involving a mail merge.

Queries allow you to sort information that is stored in database by certain protocols. For instance, if you have a database with information about a lot of different people, for example; name, age, address, etc. If you wanted to select all of the people within a certain area in order to send information it would not be difficult because you could use a query to find all those people. Mail merge uses databases to facilitate their mailing process. With the use of a mail merge you need only type one letter and choose what clients it will be sent to. This way, you do not have to type addresses each time not do you have to keep retyping the letter.

2.10.13 Outline two characteristics of four special-purpose database software application, including personal information manager, encyclopedias and library systems.

Personal information manager
A. Address/phone book
   1. Options for quick displaying specific records and printing mailing labels, address books and reports.
   2. Some include automatic phone dialing options and fields for recording notes.

11. Appointment calendar
A. Allows you to enter appointments and events and display or print them in a variety of forms.
B. May include built-in alarms for last minute reminders.

111. To do list
A. Allows users to enter and organize ongoing lists of things to do
B. Archive lists of completed tasks

IV. Miscellaneous
A. Accepts diary entries
B. Accepts personal notes or other hard to organize bits of information

2.10.14 Explain how the Boolean operators AND, OR and NOT can be used to search databases for specific information.

The Boolean operator "AND" allows one to search the database for an entry that has more than one characteristic. This way the user does not have to run several searches and compare the lists to find entries that fit several categories. The operator "OW' allows users to search a database for an entry that fits one or another categories. This saves time so that the user does not have to run too many searches. The operator "NOT" allows the user to search the database for an entry that fits the characteristic, but it also ensures that the user will not receive irrelevant entries that may fit the same category. All of these operators help to save time and make your searches more efficient.

2.10.15 Outline how data can be transferred between a word processor, database and spreadsheet.

Information can be typed into a word processor and put in a database or spreadsheet using software suites. In this way, one program can perform several tasks.

2.10.16 Discuss one situation where database management systems have been used in each of the following situations: school, business organizations, leisure activity.

Schools can use database management systems to list student information such as; transcripts, grades, names, addresses, etc. Business organizations can use database management systems to keep track or their finances and to do mail merges. Database management systems can be used as a planner for leisure activities.

2.10.17 Define data redundancy.

In computing, multiple (redundant) system elements that perform the same function. Redundancy/ Redundant Card or Power Backup components used to ensure uninterrupted operation of a system in case of failure, Also called "failsafe".

Data in multiple locations, such as on a RAID array, in backups, etc.

2.10.18 Define data integrity.

Refers to the validity of data. Data integrity can be compromised in a number of ways:

- Human errors when data is entered
- Errors that occur when data is transmitted from one computer to another
- Software bugs or viruses
- Hardware malfunctions, such as disk crashes
- Natural disasters, such as fires and floods

There are many ways to minimize these threats to data integrity. These include:

- Backing up data regularly
- Controlling access to data via security mechanisms
- Designing user interfaces that prevent the input of invalid data

Using error detection and correction software when transmitting data

2.10.19 Discuss ethical issues of privacy and security that arise from widespread use of databases, including the inappropriate collection and use of data, and the rights of the individual with respect to the storage of personal data.

A catalogue can record and then sell information from their databases to other companies. These databases include names; addresses, phone numbers and a purchasing record. People on the Internet can access databases with personal information including social security numbers and even police records. Individuals should have the right to limit what personal information is available and who is able to access it.

2.11 Sound Processing

2.11.1 List three ways in which sound can be inputted into a computer; including microphone, MIDI interface and files from the Internet.

You can install microphone software and a microphone and speak into the microphone to record wav files. You can use a MIDI device to input sound from a compatible instrument such as certain types of electric pianos. Sound can also be inputted into a computer by downloading wav files from web pages on the Internet.

2.11.2 Suggest possible political and cultural consequences arising from copying intellectual property by copying voice patterns and music from a variety of sources and reproducing them in digital form.

The person copying the property could be sent to jail or fines if they are violating a copyright. If someone steals a voice pattern, they could access sensitive information which is protected by voice activation. They could also use the voice pattern to blackmail someone.

2.12 Multimedia and Presentations

2.12.1 Define hypertext

Hypertext is a document or set of documents with "links" that help users to navigate between links and their references. Links may reference and facilitate jumps to places within a single document, to other documents in the same computer, or to documents in any computer on a network.

Text that has hyperlinks.When hypertext is viewed with an interactive browser, certain words appear as highlighted by underlining or color; clicking on a highlighted link leads to another location with more information about the subject.The term was invented by Ted Nelson.

2.12.2 Define multimedia

Multimedia is a document that contains information in more than one form; text, sound, images and video. Multimedia is communication that uses any combination of different media, and may or may not involve computers.Multimedia may include text, spoken audio, music, images, animation and video.The large amounts of data required for computer multimedia files makes CD-ROMs a good option for storage; but there are other ways of receiving multimedia communications, such as the World Wide Web.Multimedia programs are often interactive, and include games, sales presentations, encyclopedias.

2.12.3 List five media elements included in a typical multimedia program including text, images, sound and video. (pg. 167)

Text,graphics, animation, video, music, voice, and sound effects.

2.12.4 Describe the hardware needed to create multimedia

With multimedia authoring software you can create and edit multimedia documents. It involves combining source documents; including graphics, text files, video clips, sounds; in an aesthetically pleasing format that communicates.

2.12.5 Describe presentation hardware

Presentation graphics software helps to automate the creation of visual aids for lectures, training sessions, sales demonstrations, and other presentations. It includes everything from spreadsheet charting programs to animation editing software. But, presentation graphics programs are most commonly used for creating and displaying a series of on-screen "slides" to serve as visual aids for presentations.

2.12.6 Describe two advantages and two disadvantages of using presentation software as opposed to traditional lecture methods.

One advantage of using presentation software is that it makes the lecture more interesting. Traditional lectures consist just of a person speaking and tend to get boring. When people lose interest, they tend to stop listening. Another advantage is it makes learning easier. The combination of music, pictures, and text make it easier for visual as well as audio learners to understand what is being presented. One disadvantage of using presentation software is that the computer can break down at any time. If the computer is not working, then you will not be able to run your presentation. Another disadvantage of using presentation software is that sometimes files are unable to be opened after saving because the computer did something wrong. When you go to show this presentation, it is possible that the file won't open.

2.12.7 Discuss principles of good design for multimedia applications, including consistency of screen layout, clear navigating tools, image map and attention to text clarity.

The screen layout must not consist of too many images or too many different colors/fonts because that can be distracting and can also be difficult to read. Text should not be in a font that is very fancy because those can be hard for people to read. In general, everything needs to be neat, organized and not crowded because these can all be distracting and make the application hard to read and use.

2.12.8 Define storyboard.

The storyboard contains information on graphics, video, sound, text, audience interaction, color, type, fonts, type size, etc. In other words, everything necessary for crew members involved in production to do their jobs. Again, it doesn’t have to be a work of art. It needs to be detailed enough so each crew member knows what to do and the Studio gets a clear picture of what will be happening throughout the whole program and exactly what it will look like.

2.12.9 Explain why file compression is so important for the storage of music/sound, images and video.

A full-screen 256-color photograph or painting takes about a megabyte of storage - the same as the complete text from a typical paperback book! Graphic images, digital video, and sound files can consume massive amounts of storage space on disk and in memory; they can also be slow to transmit over computer networks. Data compression technology allows large files to be temporarily squeezed so they take less storage space and network transmission time. Before they can be used, compressed files must be decompressed. All forms of compression involve removing bits; the trick is to remove bits that can be replaced when the file can be restored. Different compression techniques work best for different types of data.
Example:
1 CD-ROM = 450 1440K diskettes = 500 books (text only)

2.12.10 Discuss the benefits and limitations of using printed documents as opposed to multimedia.

Printed documents allow you to visualize your information on paper or another medium. Multimedia can only be viewed using some type of device, such as a computer

2.12.11 Discuss one benefit and one drawback that the use of multimedia encyclopedias and information sources have on each of the following groups: individuals, communities and institutions/organizations.

2.12.12 Suggest possible environmental, ergonomic an psychological consequences arising from copying intellectual property by duplicating images and video from a variety of sources and reproducing them in digital form.

2.12.13 Explain circumstances when it is acceptable for an individual to duplicate and incorporate the intellectual property of another person.

2.13 Tutorial and Training Software

2.13.1 Define tutorial software.

Software that provides direct instruction in a clearly specified skill or subject

2.13.2 Define training software.

Training software is software that is used in training an individual for a specific purpose.

2.13.3 Explain the principles involved in the way wizards accomplish various tasks, including drawing charts using spreadsheet software, producing reports using database management systems and setting a mail merge.

An interactive help utility that guides the user through a potentially complex task, such as configuring a PPP driver to work with a new modem. Wizards are often implemented as a sequence of dialog boxes which the user can move forwards and backwards through, filling in the details required. The implication is that the expertise of a human wizard in one of the above senses is encapsulated in the software wizard, allowing the average user to perform expertly.

A utility within an application that helps you use the application to perform a particular task. For example, a "letter wizard" within a word processing application would lead you through the steps of producing different types of correspondence.

An enhancement to programs that makes them easier to operate by guiding you through, step by step, what is required to achieve your purpose.

2.13.4 Discuss how the various applications of tutorial and training software can help both developed and developing countries in the areas of business, industrial training and classroom teaching.

2.13.5 Discuss the possible consequences of the widespread use of training software in the classroom.

Since there are so few teachers compared to the number of students, it takes much more time for all of the students to get the same amount of information, also since technology is always evolving, teachers may not always have updated information on computer technology. Using training software may cause teachers to rely too much on the software rather than their own teaching abilities, and take away some of the personal classroom interaction.

2.13.6 Compare traditional teaching methods with training software in three specific situations including flight training and learning a word processor package.

Training software makes flight training more realistic and expands upon what in instructor can teach by himself. Word processor package can also be taught more easily using training software to exemplify its capabilities. Driving simulators are used during driver's education, they help the student to know what it feels like to drive before they actually get into the driver's seat.

2.14 Robotics, Artificial Intelligence and Expert Systems

2.14.1 State Asimov's three "laws" of robotics.

- A robot may not injure a human being, or, through inaction, allow a human being to come to harm.
- A robot must obey the orders given it by human beings, except where such orders would conflict with the first law.
- A robot must protect its own existence as long as such protection does not conflict with the first or second law.

2.14.2 Explain which "law" of robotics would apply in any appropriate situation.

The first law saying that a robot may not injure a human being or allowing a human being to come to harm. The other 2 laws are dependent on the first one.

2.14.3 Discuss the appropriateness of using robots to accomplish various tasks.

Robots are designed to perform manual tasks. Robots should be used to assist humans in their tasks that require manual ability rather than mental.

2.14.4 Discuss situations involving ethical considerations that can arise from the use of robots in place of people with respect to economic, cultural and psychological effects.

Robots can be used in a variety of workplaces such as factories. These robots would be replacing human workers damaging the job market, and therefore the economy.
This would alter our culture as many people would be unemployed because of robots. It would also have lasting psychological effects with people being put out of work by machines and damaging their self esteem.

2.14.5 Define Turing test.

A proposed test for machine intelligence that involves fooling a human judge into believing that typed computer responses were produced by a human.

A criterion proposed by Alan Turing in 1950 for deciding whether a computer is intelligent. Turing called it "the Imitation Game" and offered it as a replacement for the question, "Can machines think?"

A human holds a written conversation on any topic with an unseen correspondent (nowadays it might be by electronic mail or chat). If the human believes he is talking to another human when he is really talking to a computer then the computer has passed the Turing test and is deemed to be intelligent.

Turing predicted that within 50 years (by the year 2000) technological progress would produce computing machines with a capacity of 10**9 bits, and that with such machinery, a computer program would be able to fool the average questioner for 5 minutes about 70% of the time.

The Loebner Prize is a competition to find a computer program which can pass an unrestricted Turing test.

2.14.6 Discuss various definitions of Artificial intelligence (AI).

- Artificial intelligence is the study of ideas which enable computers to so the things that make people seem intelligent.
- Artificial intelligence is the study of how to make computers do things at which., at the moment, people are better.
- Artificial intelligence is the study of the computations that make it possible to perceive, reason, and act.

The subfield of computer science concerned with the concepts and methods of symbolic inference by computer and symbolic knowledge representation for use in making inferences. AI can be seen as an attempt to model aspects of human thought on computers. It is also sometimes defined as trying to solve by computer any problem that a human can solve faster.

Examples of AI problems are computer vision (building a system that can understand images as well as a human) and natural language processing (building a system that can understand and speak a human language as well as a human). These may appear to be modular, but all attempts so far (1993) to solve them have foundered on the amount of context information and "intelligence" they seem to require.

2.14.7 Explain the importance of the Turing test to the debate about whether machines can think.

The Turing test is a computer that acts as a person that can think and gives the impression that it can think. People argue that machine can not think, but the Turing test attempts to dispute that.

2.14.8 Discuss the issues related to the concept of AI in at least one situation.

Most people have trouble knowing and describing how they do things. Human intelligence includes unconscious thoughts, instantaneous insights, and other mental processes that are difficult or impossible to understand and describe.

There are great differences in structure and capabilities of the human brain and the computer. Even the most powerful super computers can not come near the brains ability to perform parallel processing-breaking a complex job into many smaller, simpler jobs and completing those jobs simultaneously.

The best way to do something with a machine is often very different from the way people do it. Many early AI attempts failed because they were designed to mimic human intelligence rather than take advantage of the computers unique capabilities.

2.14.9 Evaluate the use of AI in at least one situation.

Eliza-one of first software programs to converse in a limited form of natural language. It simulated the role of a therapist in a typed conversation with a patient. It seemed to work at first, but was not really understanding what it was saying and only caused further confusion in the patient’s mind.

2.14.10 Define expert system.

A software program designed to replicate the decision making process of a human expert.

A computer program that contains a knowledge base and a set of algorithms or rules that infer new facts from knowledge and from incoming data.

An expert system is an artificial intelligence application that uses a knowledge base of human expertise to aid in solving problems. The degree of problem solving is based on the quality of the data and rules obtained from the human expert. Expert systems are designed to perform at a human expert level. In practice, they will perform both well below and well above that of an individual expert.

The expert system derives its answers by running the knowledge base through an inference engine, a software program that interacts with the user and processes the results from the rules and data in the knowledge base.
Expert systems are used in applications such as medical diagnosis, equipment repair, investment analysis, financial, estate and insurance planning, route scheduling for delivery vehicles, contract bidding, counseling for self-service customers, production control and training.

2.14.11 Explain the concept of "fuzzy logic/rules" and its dependence on knowledge bases.

"Fuzzy rules" state conclusion as probabilities rather than certainties and the knowledge base is used to form these rules.

A formal system of logic in which numbers on a scale from 0 to 1 are used instead of the values "true" and "false" as absolutes, to accurately represent the fact that some questions do not have a simple yes or no answer.Fuzzy logic was developed by Lofti Zadeh of the University of California, Berkeley.

A type of logic that recognizes more than simple true and false values. With fuzzy logic, propositions can be represented with degrees of truthfulness and falsehood. For example, the statement, *today is sunny*, might be 100% true if there are no clouds, 80% true if there are a few clouds, 50% true if it's hazy and 0% true if it rains all day.

Fuzzy logic has proved to be particularly useful in expert system and other artificial intelligence applications. It is also used in some spell checkers to suggest a list of probable words to replace a misspelled one.

Fuzzy logic seems closer to the way our brains work. We aggregate data and form a number of partial truths which we aggregate further into higher truths which in turn, when certain thresholds are exceeded, cause certain further results such as motor reaction. A similar kind of process is used in artificial computer neural networks and expert systems..

2.14.12 Describe how expert systems can be used in each of the following situations financial transaction, games and writing plays.

Financial transactions-keeps track of all of the money easily games-uses a computer brain to play a game and outsmart the opponent writing plays-helps in grammar and spelling and sentence structure.

2.15.1 Define virtual reality (VR).

A user interface that looks to the user like an artificial world.

Computer simulations that use 3D graphics and devices such as the data glove to allow the user to interact with the simulation.

A form of network interaction incorporating aspects of role-playing games, interactive theater, improvisational comedy, and "true confessions" magazines. In a virtual reality forum (such as Usenet's alt.callahans newsgroup or the MUD experiments on Internet and elsewhere), interaction between the participants is written like a shared novel complete with scenery, "foreground characters" that may be personae utterly unlike the people who write them, and common "background characters" manipulable by all parties. The one iron law is that you may not write irreversible changes to a character without the consent of the person who "owns" it, otherwise, anything goes.

Virtual reality, sometimes called VR, refers to computer simulations of real-world "environments" that use 3-D graphics and external devices like a dataglove or helmet to allow users to interact with the simulation. Users move through virtual reality environments as though they were navigating in real worlds -- walking through structures and interacting with objects in the environment.

An artificial environment created with computer hardware and software and presented to the user in such a way that it appears and feels like a real environment. To "enter" a virtual reality, a user dons special gloves, earphones, and goggles, all of which receive their input from the computer system. In this way, at least three of the five senses are controlled by the computer. In addition to feeding sensory input to the user, the devices also monitor the user's actions. The goggles, for example, track how the eyes move and respond accordingly by sending new video input.

To date, virtual reality systems require extremely expensive hardware and software and are confined mostly to research laboratories.

The term *virtual reality* is sometimes used more generally to refer to any virtual world represented in a computer, even if it's just a text-based or graphical representation.

2.15.2 Outline three applications of VR.

- Games-People play virtual reality games, they make the person feel as if they are really in the game.
- Simulation software-Virtual reality is used to make simulation software more realistic.
- Medical training-Virtual reality is used for pre-med students in their training.
- Tours-Virtual reality is used on the Internet to give tours.

2.15.3 Explain how computer games can incorporate aspects of VR, with reference to two examples.

Computer games incorporate aspects of VR because the screen is virtual reality and it makes the player feel is if they are in the game. One type of game is a race, where the players feel like they are in a car and are racing against each other. Another game is a maze, where you feel like you are in the maze, and you have to try to get out.

2.15.4 Describe the developments and trends that have occurred in computer games including high resolution graphics, quicktime video, game levels and networked games.

Video games have developed very much over the years. High resolution graphics make the games look and feel more realistic. Quicktime video makes the timing of the timing of the game faster and more smooth. Game levels help the player increase the skills. Networked games allow the players to play with each other on separate computers.

2.15.5 Discuss the possible social consequences for individuals communities and institutions/organizations arising from the widespread use of computer games.

The games can be addictive, resulting in people becoming withdrawn from others. People will do nothing but stay in the house all day and play the games, this becomes very unhealthy.

2.15.6 Discuss situations involving ethical considerations that can arise from the use of computer games with respect to economic, cultural and psychological effects.

People's addictions to games can become ethical. They will actually become so addicted, they will take off of work to play the games all day. This can affect them psychologically, they will get upset if somebody tries to take them away from their games. The people who play these games so often, will begin to invert our culture, and not be aware to the outside world.

TOPIC 3: CONVERGING INFORMATION TECHNOLOGIES

3.1.1 Outline how radio and computer technologies have converged with reference to the ability of computers to receive radio signals and with reference to computer-controlled radio libraries and recording studios.

3.1.2 Define teletext.

A communication system that broadcasts text information by a television signal to receiving equipment equipped with software or chips that perform decoding.

3.1.3 Describe the hardware and software components required for video-on-demand.

ISDN - A set of communication standard allowing a single wire or optical fiber to carry voice, digital network services and video. ISDN is intended to eventually replace the plain old telephone system. VGA - A display standard for IBM PC's with 640x480 pixels in 16 colors and a 4:3 aspect ratio. There is also a text mode with 720x4OO pixels. VIDEO MEMORY - The memory in a computer's graphics adapter, used to store the image displayed on a bitmap display. Often this is built using VRAM chips. There is normally a simple correspondence between groups of bits in video memory and the dots or "pixels" on the screen such that writing to a given group of bits will alter the appearance of a single dot. If each pixel corresponds to eight bits then it can have any of 256 colors, or shades of gray on a monochrome display.

3.1.3 Outline three examples where television and computer technologies have converged, including access to radio and television broadcasts over the Internet.

3.1.4 Discuss situations involving ethical considerations that arise from the convergence of computing and broadcast technologies.

3.2 Non-broadcast Media

3.2.1 Discuss the impact that the developments and trend in DTP software and hardware have had on the publishing industry.

Desktop Publishing now makes it possible for a single person with a modest equipment investment to do all the writing, editing, graphic production, design, page layout, and typesetting for a desktop publication. Publications that used to cost hundreds or even thousands of dollars to produce through outside publishing services can now be produced in-house for a fraction of their former cost. What's more important is that desktop publishing saves time. It also reduces the quantity of publication errors.

3.2.2 Describe three examples of the ways in which the publishing industry uses computer technology to provide information in a paperless medium including encyclopedias on CDROM and Internet versions of reading material.

CD-ROM: A non-volatile optical data storage medium using the same physical format as audio compact disks, readable by a computer with a CD-ROM drive. CD-ROM is popular for distribution of large databases, software and especially multimedia applications. The maximum capacity is about 600 megabytes. A CD can store around 640 megabytes of data. WEB PAGE: A block of data available on the world wide web, identified by a LJRL (Universal Resource Locator). In the simplest, most common case, a web page is a file written in HTML, stored on a server. It may refer to images which appear as part of the page when it is displayed by a web browser. It is also possible for the serve to generate pages dynamically in response to a request, e.g. using a CGI script.
Three examples that are paperless mediums are encyclopedias on CD-ROM, Web pages that have articles and mapping programs.

3.3 Visual and Performing Arts

3.3.1 Discuss two ways IT is used in each of the following areas: film, music, art, theater and dance.

Film: digital cameras, computer generated characters Music: synthesizers, electric drums Art: plotters, drawing boards Theater: sound boards, microphones Dance: digital music, lights

3.3.2 Suggest the possible social significance of digital TV with respect to the effect on people's leisure time, including attendance at the live theatrical and musical events.

3.4 Personal Communications

3.4.1 Describe how telephone technology and IT have converged including digital switching, cellular digital telephones, caller ID, call forward, and storage of frequently dialed numbers.

3.4.2 Compare the benefits and limitations of communicating via fax, e-mail, voice telephone and traditional postal services.

Benefits: E-mail doesn't depend on location. It facilitates group communications. It is less intrusive than the telephone and makes long distance meetings possible. Fax allows documents to be transferred from one pace to another and can be edited and combined with other computer-generated documents. It doesn't depend on location. It facilitates group communications. It is less intrusive than the telephone and makes long distance meetings possible. **Limitations:** E-mail and teleconferencing are vulnerable to machine failures, human errors and security breaches. E-mail can pose a threat to privacy. E-mail can be faked.

3.4.3 Explain two ways in which each of the following devices can improve personal productivity: voicemail, pagers, and personal digital assistants.

All allow people to be able to communicate with one another much faster. If one needs to get in contact with someone all her or she has to do is page him or her. If one wants to leave a message they can leave a message on voicemail. Voicemail is more convenient than an answering machine, unlike the answering machine, one can check messages from any phone.

3.4.4 Outline the requirements concerning rates of data transmission to enable realistic teleconferencing and video conferencing.

Graphics card: A circuit board fitted to a computer, especially and IBM-PC, containing the necessary video memory and other electronics to provide a bitmap display. Video dial tone: A means by which telephone companies can deliver television programs on a common carrier basis and, by law, provide equal access to all. Video display unit: A device incorporating a cathode ray tube (CRT) display, a keyboard and a serial port. A VDU usually also includes its own display electronics which store the received data and convert it into electrical waveforms to drive the CRT. Bandwidth: The amount of data that can be sent through a given communications circuit per second.

3.4.5 Discuss the social significance of the increasing use of portable communications devices including the environmental impact of relay stations, the consequences of using up communication wavelengths and psychological and cultural effects.

3.4.6 Discuss the impact that teleconferencing and video conferencing have had on business and can have on education, including the significance of economic and organizational factors.

Business: Allows people to communicate face-to-face over long distances. Those who are unable to attend physically because of isolation or being disable or hospitalized can now attend. Conference rooms use it to meet with long distance members of their meeting. Allows callers to transmit pictures and documents which can then be edited and transferred much faster. It also increases productivity in the company. Education: Allows for individual learning. Students are able to learn at their own pace. It motivates. Computers turn learning into an entertainment game. This motivation allows students to practice their arithmetic, spelling, piano playing, etc. It allows timid children to become comfortable with their learning and allows them to build confidence. The program is patient and allows the student to learn at his/her own pace, therefor the student doesn't feel pressured.

3.4.6 Evaluate the possible ethical considerations that could arise from the disparity between IT-rich and IT-poor nations with respect to the availability of teleconferencing and video conferencing.

3.4.8 Suggest possible psychological and cultural consequences arising from the use of teleconferencing and video conferencing with respect to personal communications including voice, tone, inflections, timing and body language.

Teleconferencing:
• Can pose a threat to privacy
• E-mail and documents can be faked
• Can only be used if everyone plays
• Filter out many human components of communication

Video Conferencing:
- Allows others to see the reaction of people to certain issues
- Body language says a lot, when one is on the phone he/she does not have to worry about body language; only tone of voice.

3.4.9 Discuss the environmental effects that have resulted from the proliferation of satellite-based communications.

Satellites have replaced many telephone cables and radio towers, allowing electronic signals to be beamed across the oceans, deserts, and mountain ranges, linking the people of the world with a single communications network. Today the satellite based device has changed the way people communicate.

Topic 4: Networks and the Internet

4.1 Networks

4.1.1 Define *local area network (LAN)*.

A computer-based communications network which is limited to approximately 1 km radius, often within a single office, building, or single company location.

4.1.2 Define *wide area network (WAN).*

A computer network, larger than a local area network, serving more than one geographical location, e.g. several company sites, an entire state or country, or several countries.

4.1.3 Define *server*

A program that provides services requested by client programs.
A computer that provides services to other computers connected over a network.

4.1.4 Define *client*

A computer program that requests the service of another computer system, a "server"

4.1.5 Outline the basis anatomy of a network with reference to basic topology and ISO concept of layers.

I. Different arrangements used in topology
   A. Bus (linear)
      1. Group of 8, 16, or 32 wires.
      2. Carries information between computer components.
         A. Star
         B. Ring

II. ISO
   A. ISO refers to seven layers for network information.
   B. Three are basic.
      1. Bottom (local network): the hardware and software for transmission.
      2. Middle (protocols): The software for protocols such as TCP/IP.
      3. Top (applications): Programs that get the work done, such as e-mail.

4.1.6 Discuss the hardware and software requirements of a LAN.

A collection of computers and peripherals; each computer and shared peripherals is an individual node on the network. Nodes are directly connected by cables, which serve as information highways for transporting data between machines.

4.1.7 Discuss the advantages and disadvantages of a network with a standalone, single-user system, referring to hardware, software, and the people involved.

Some advantages would include allowing people to share hardware, data, and software programs, and allowing people to work together. Some disadvantages would include less privacy, slower to process information, and more expenses to pay.

4.1.8 **Compare the requirements, benefits and limitations of LANs with WANs**.

LAN is a network in which the computers are close to each other, usually in the same building. WAN is a network that extends over a long distance. WAN are private operations that are able to link corporate offices. LANs can contain a variety of computes and peripherals connected together. WAN are often made up of LANs linked by phone lines, microwave towers, and communication satellites.

4.1.9 Define *electronic mail* (e-mail).

Documents or messages exchanged electronically over computer networks. Electronic mail is typically sent to mail server computer where the document is held until the intended recipient connects to the mail server and reads or downloads the documents. Electronic mail notes may have files attached.

4.1.10 Compare the advantages and disadvantages of e-mail with other forms of communication (post, telephone, and fax) including speed, dependence on location, and the ability to facilitate individual and group communication.

E-mail is fast, it doesn't depend on location, it facilitates group communication, and e-mail messages are digital data that can be edited and combined with other computer-generated documents. On-line communication is less intrusive than the telephone, and it allows time-shifting. E-mail allows decisions to evolve over time, and it makes long-distance communication possible. However, e-mail is vulnerable o machine failures, human errors, and security breaches. Also, e-mail can pose a threat to privacy, it can be faked, it only works if the subscribers regularly log in and check their mail, and e-mail can filter out many "human" components of communication.

4.1.11 Describe a client/server network system in reference to the concept of distributed or enterprise computing.

The client/server model is a hierarchical model in which one or more computers act as dedicated servers and all the remaining computers act as clients. Each server is a high-speed, high-capacity computer containing data and other resources to be shared with client computers.

4.1.12 Suggest an etiquette (set of rules) for the use of e-mail, including the length of messages, tone, the use of the quote feature in replies and ethical considerations in regard to privacy.

- Say what you mean and say it with care.
- Keep it short and to the point.
- Proofread your messages.
- Learn the "nonverbal" language of the network.
- Avoid lynch-mob mentality.
- Don't be a source of electronic junk mail.
- Lurk before you leap.
- Check your FAQ's

4.1.13 Define *groupware.*

Groupware is software designed to be used by workgroups rather than individuals.

Software for people working together on a project.Groupware makes it possible for several people to work on the same file at once, via a network.It also helps with scheduling meetings and other kinds of group planning.Lotus Notes is a popular groupware package.

4.1.14 Describe one example of how groupware can be applied to workplace.

Groupware programs include multi-user appointment calendars, project management software, database management systems, and software for group editing of text-and-graphics documents.

4.1.15 Discuss three ways in which networks have affected redesign of the workplace environment, including collaborative team ventures and greater access to information for decision making.

Networks have affected the redesign of the workplace by being close together in small clusters in order to work on group projects, it makes information easy accessed from the Internet, and offices more organized and compact with close placement of computers.

4.2 The Internet

4.2.1 Define the *Internet.*

The word Internet is usually capitalized to indicate that it is a special set of connected computers. It is the largest network in the world, consisting of many different physical networks. These use various protocols, including the Internet Protocol, to communicate.

4.2.2 Outline the main services found on the Internet including e-mail, listservs, newsgroups, FTP and the World Wide Web.

I. E-mail: Internet user can send mail messages, data files, and software Programs to other Internet users and to users of most commercial
II. Listservs are electronic discussion support systems. Users can subscribe and unsubscribe by e-mail. All messages sent to the discussion list are automatically sent to all subscribers. Most list servers support archiving of the messages by day, week, month or year.
III. Newsgroups are Internet discussion groups to which people may subscribe. Any message posted to the group is sent to all subscribers. Very few newsgroups are moderated; that is messages being first reviewed by a person who may censor or restrict what is posted. The news groups are processed b news or discussion group servers that receive and store the messages for distribution to subscribers.
IV. FTP (file transfer protocol) is a protocol used to transfer files from one computer to another through the Internet or an intranet.

4.2.3 Explain the relationship of the World Wide Web to the Internet.

The World Wide Web is a distributed browsing and searching system. It is a system for exploring, viewing, and publishing multimedia documents on the Internet.

4.2.4 Explain the importance of protocols to such networks.

The Web is built around a naming scheme that allows every information resource on the Internet to be referred to using a Uniform Resource Locator (URL.) For example: http://www.trinityhs.org. The first part of this URL refers to the protocol that must be used to access information. It might be FTP, Gopher, news, or something else. It's most commonly *http*, for *hypertext transfer protocol*, the protocol used to transfer the Web's hypermedia documents across the net.

4.2.5 Define *bandwidth*.

Bandwidth is the quantity of information that can be transmitted through a channel in a given amount of time. The channel might be a cable connecting networked computers, a radio channel, or even a human-machine interface.

1.The amount of data that can be sent through a network connection, measured in bits per second (bps). 2.The range of transmission frequencies a network can use, expressed as the difference between the highest and lowest frequencies of a transmission channel (in Hertz, or cycles per second). High bandwidth allows fast transmission or high-volume transmission.

4.2.6 Define *ISDN* (Integrated Services Digital Network).

ISDN is a type of network that links telephones, computers, fax machines, television, and even mail in a single digital system.

(ISDN).Digital telecommunications lines that can transmit both voice and digital network services, and are much faster than the highest-speed modem.ISDN lines are offered by many telephone companies.

4.2.7 Compare the feasibility of a dial-up connection, requiring a modem, with the use of a leased line or ISDN.

A dial-up connection is more feasible than ISDN, because it is simpler. ISDN requires the linkage of several different machines in order to work.

4.2.8 Explain the importance of the transmission speed of modems in reference to baud rate and bits per second (bps).

Modems differ in their transmission speeds, measured in bits per second (bps). Many people use the term baud rate instead of bps, but bps is technically more accurate for high-speed modems. Modems today commonly transmit at 9600 bps to 28.8K (28, 800) bps.

4.2.9 Define *URL*.

The address of a Web page or other resource of the World Wide Web. URL is also known as Uniform Resource Locator.

4.2.10 Define *HTML*.

A language that describes the format, layout, and logical structure of a hypermedia document. HTML is the language used to describe most pages on the World Wide Web and is also known as Hypertext Markup Language.

4.2.11 Define *HTTP*.

The protocol used to transfer the Web's hypermedia documents across the net. HTTP is also known as hypertext transfer protocol.

4.2.12 Discuss the features of a Web browser including hyperlinks, GUIs, and integration of other Internet services.

The best way to navigate and view Web pages is with a Web browser. This is a client program like Netscape Navigator or Microsoft's Internet Explorer that allows you to explore the Web by clicking on "hot" words or pictures on home pages. GUIs, also known as graphical user interfaces, is sported by the Macintosh operating system. With the mouse the user points to pictures, known as icons, that represent files, folders (collection of files), and disks. Documents are displayed in windows – framed areas that can be opened, closed, and rearranged with the mouse. The user selects commands from pull-down menus at the top of the screen. Because this kind of graphical user interface does not require users to memorize commands, it allows users who are new to a program to be up and running in a fraction of the time it takes to learn a command-line system. Graphical user interfaces with windows, icons, menus, and pointing devices (collectively known as WIMP) offer several clear advantages from the user's point of view. They are intuitive, consistent, forgiving, protective, and flexible (page 90). Some browsers provide a uniform interface for the Internet so you can send and receive mail, participate in newsgroups, explore Gopher sites using the same interface you use to navigate the Web. A browser like Netscape Navigator is like an all-purpose window into the Internet.

4.2.13 Define *search engine*.

A remotely accessible program that lets you do keyword searches for information on the Internet. There are several types of search engine; the search may cover titles of documents, URLs, headers, or the full text.

A program that searches documents for specified keywords and returns a list of the documents where the keywords were found. Although *search engine* is really a general class of programs, the term is often used to specifically describe systems like Alta Vista and Excite that enable users to search for documents on the World Wide Web and USENET newsgroups.

Typically, a search engine works by sending out a *spider* to fetch as many documents as possible. Another program, called an *indexer*, then reads these documents and creates an index based on the words contained in each document. Each search engine uses a proprietary algorithm to create its indices such that, ideally, only meaningful results are returned for each *query*.

4.2.14 Suggest two strategies for limiting a key word search in a search engine.

4.2.15 Annotate addresses such as http://www.ibo.org to show the meaning of each part.

This is an example of an URL, Uniform Resource Locator. The first part of this URL refers to the protocol that must be used to access information; it might be FTP, Gopher, news, or something else. It is most commonly *http*, for *hypertext transfer protocol*, the protocol used to transfer the Web's hypermedia documents across the net. The second part (the part following the //) is the address of the host containing the resource; it uses the same domain naming scheme used for e-mail addresses. The third part following the dot address, describes the path to the particular resource on the host-the hierarchical nesting of directories (folders) that contain the resource.

4.2.16 Suggest an etiquette (set of rules) for controlling access to Web sites that contain information considered immoral or unethical.

4.2.17 Discuss the means involved in blocking access to 'objectionable' material on the Internet.

4.2.18 Define *intranet*.

A self-contained intra-organizational network that is based on the same technology as the Internet. Intranet Web pages, newsgroups, electronic mail, and other Internet-style services are designed mainly for use within the organization.

4.2.19 Discuss four advantages of using an intranet in a school or business including cost effectiveness, open standards and user creation of content.

One advantage of using an intranet is cost effectiveness. People within a company can send and receive memos and other important information by computer rather than wasting paper and time. An intranet prevents other businesses and intruders from receiving or finding out information. An intranet can also monitor the work and activities of other co-workers in the company, monitoring illegal activities or other activities that are not supposed to take place.

4.2.20 Compare the economic, legal and political significance of the Internet with an intranet.

The intranet Web document, etc. might be accessible only to users within the organization, not to the entire Internet community. If an intranet has a gateway connection to the Internet, the gateway probably has some kind of firewall to prevent unauthorized communication and secure sensitive internal data.

This prevents companies and intruders from receiving or finding out personal information. It is an easier mode of communication and more efficient because memos and other important (shared) information are received and sent by computer, reducing the amount of paper used. An intranet can also monitor the work and activities of other co-workers in the company, monitoring illegal functions and illegal activities of other workers.

4.2.21 Evaluate possible ethical considerations that could arise from the disparity between IT-rich and IT-poor nations with respect to the degree of access to the Internet and the reliability of this access.

IT-rich nations would have almost unlimited access to the Internet, but the information would vary in reliability because people would be able to afford to put any information on the Internet, including opinions and other unreliable sources. Since anyone would be able to input information on the Internet, all the information on the Internet can not be dependable. On the other hand, IT-poor nations would have very limited or no access to the Internet. They may not receive the same quality of education, and they will also lag behind on information and other accessibility. The reliability of this access will also vary. The quality of education and lack of technological knowledge may make the information unreliable while some information may be reliable sources.

4.2.22 Discuss the increased risk of computer crime and infection by worms arising from the widespread use of networks.

4.2.23 Compare the just-in-case (JIC) model of information delivery with the just-in-time (JIT) model with respect to institutions/organizations.

4.2.24 Suggest the possible social significance of, and ethical considerations arising from, new developments in Internet technology, including network computers (NCs), Web crawlers and Java.

4.2.25 Define *cryptography*.

The science of scrambling the contents of messages, often consisting of both hardware and software components.

4.2.26 Discuss the ethical considerations involved in the use of encryption on the Internet.

The use of encryption is supposed to protect the user, but in some cases, encryption can harm the users of the Internet instead. Encryption can be used by intruders by encrypting their own information, making it harder for authorities to crack the code and catch the intruders. In the same way, information from other companies, businesses, etc. can be encrypted by intruders, causing companies and authorities to have a difficult time translating and recovering the information. Encryption causes difficulties for authorities and those regulating information on the Internet and other computer activities because information is nearly impossible to translate.

2.4.17 BUG

An unwanted and unintended property of a program or piece of hardware, especially one that causes it to malfunction. Antonym of feature. E.g. "There's a bug in the editor: it writes things out backwards." The identification and removal of bugs in a program is called "debugging".

Admiral Grace Hopper (an early computing pioneer better known for inventing COBOL) liked to tell a story in which a technician solved a glitch in the Harvard Mark II machine by pulling an actual insect out from between the contacts of one of its relays, and she subsequently promulgated bug in its hackish sense as a joke about the incident (though, as she was careful to admit, she was not there when it happened). For many years the logbook associated with the incident and the actual bug in question (a moth) sat in a display case at the Naval Surface Warfare Center (NSWC). The entire story, with a picture of the logbook and the moth taped into it, is recorded in the "Annals of the History of Computing", Vol. 3, No. 3 (July 1981), pp. 285--286.

The text of the log entry (from September 9, 1947), reads "1545 Relay #70 Panel F (moth) in relay. First actual case of bug being found". This wording establishes that the term was already in use at the time in its current specific sense - and Hopper herself reports that the term "bug" was regularly applied to problems in radar electronics during WWII.

Indeed, the use of "bug" to mean an industrial defect was already established in Thomas Edison's time, and a more specific and rather modern use can be found in an electrical handbook from 1896 ("Hawkin's New Catechism of Electricity", Theo. Audel & Co.) which says: "The term "bug" is used to a limited extent to designate any fault or trouble in the connections or working of electric apparatus." It further notes that the term is "said to have originated in quadruplex telegraphy and have been transferred to all electric apparatus."

The latter observation may explain a common folk etymology of the term; that it came from telephone company usage, in which "bugs in a telephone cable" were blamed for noisy lines. Though this derivation seems to be mistaken, it may well be a distorted memory of a joke first current among *telegraph* operators more than a century ago!
Actually, use of "bug" in the general sense of a disruptive event goes back to Shakespeare! In the first edition of Samuel Johnson's dictionary one meaning of "bug" is "A frightful object; a walking spectre"; this is traced to "bugbear", a Welsh term for a variety of mythological monster which (to complete the circle) has recently been reintroduced into the popular lexicon through fantasy role-playing games.
In any case, in jargon the word almost never refers to insects.

2.5.9 VIRUSES, ETC.

VIRUS: A program that infects a computer by atttaching itself to another program, and propagating itself when that program is executed.A computer can become infected by files downloaded over a network, or by the installation of new software or floppy disks that are infected with viruses.Some viruses are only pranks, and perform harmless actions like displaying a screen with a joke message on it.Others can destroy files or wipe out a hard drive.

TROJAN HORSE: A program that appears to be useful and harmless but which has harmful side effects such as destroying data or breaking security on the system on which it is run.It is similar to a virus except that it does

not propagate itself as a virus does.

WORM: A computer program that can make copies of itself, and spreads through connected systems, using up resources in affected computers or causing other damage.

LOGIC BOMB: Code that is hidden in a program or system which will cause something to happen when the user performs a certain action or when certain conditions are met.A logic bomb, which can be downloaded along with a corrupted shareware or freeware program, may destroy data, violate system security, or erase the hard disk.It is not the same as a virus because the logic bomb executes once, or at periodic intervals, whereas the action of a virus is ongoing.

2.9.1 MODELING

A description of observed behaviour, simplified by ignoring certain details. Models allow complex systems to be understood and their behaviour predicted within the scope of the model, but may give incorrect descriptions and predictions for situations outside the realm of their intended use. A model may be used as the basis for simulation.

2.9.2 SIMULATION

Attempting to predict aspects of the behavior of some system by creating an approximate (mathematical) model of it. This can be done by physical modeling, by writing a special-purpose computer program or using a more general simulation package, probably still aimed at a particular kind of simulation (e.g. structural engineering, fluid flow). A typical example is an aircraft flight simulator.

Creating a mathematical model of a real system, to see how the system works and, by changing variables, make predictions about how the system will change.For example, a mathematical simulation of an insect population and its habitat could include such variables as available food supply, natural predators, and rainfall.Changing one of the variables in the simulation would show how the population is affected when that variable changes in the real system.

The process of imitating a real phenomenon with a set of mathematical formulas. Advanced computer programs can simulate weather conditions, chemical reactions, atomic reactions, even biological processes. In theory, any phenomena that can be reduced to mathematical data and equations can be simulated on a computer. In practice, however, simulation is extremely difficult because most natural phenomena are subject to an almost infinite number of influences. One of the tricks to developing useful simulations, therefore, is to determine which are the most important factors.
In addition to imitating processes to see how they behave under different conditions, simulations are also used to test new theories. After creating a theory of causal relationships, the theorist can codify the relationships in the form of a computer program. If the program then behaves in the same way as the real process, there is a good chance that the proposed relationships are correct.

2.10.1 DATABASE

One or more large structured sets of persistent data, usually associated with software to update and query the data. A simple database might be a single file containing many records, each of which contains the same set of fields where each field is a certain fixed width.

A database is one component of a database management system.

1.A large collection of data organized for rapid search and retrieval. 2.A program that manages data, and can be used to store, retrieve, and sort information.Some database programs are Lotus Approach, Microsoft Access, Filemaker, and dBASE.

1) A collection of information organized in such a way that a computer program can quickly select desired pieces of data. You can think of a database as an electronic filing system.

Traditional databases are organized by *fields*, *records*, and *files*. A field is a single piece of information; a record is one complete set of fields; and a file is a collection of records. For example, a telephone book is analogous to a file. It contains a list of records, each of which consists of three fields: name, address, and telephone number.

An alternative concept in database design is known as *Hypertext*. In a Hypertext database, any object, whether it be a piece of text, a picture, or a film, can be linked to any other object. Hypertext databases are particularly useful for organizing large amounts of disparate information, but they are not designed for numerical analysis.

To access information from a database, you need a *database management system (DBMS)*. This is a collection of programs that enables you to enter, organize, and select data in a database.

(2) Increasingly, the term *database* is used as shorthand for *database management system.*

2.10.17 DATA REDUNDANCY

In computing, multiple (redundant) system elements that perform the same function.
Redundancy/ Redundant Card or Power Backup components used to ensure uninterrupted operation of a system in case of failure, Also called "failsafe".

Data in multiple locations, such as on a RAID array, in backups, etc.

2.10.18 DATA INTEGRITY

Refers to the validity of data. Data integrity can be compromised in a number of ways:

- Human errors when data is entered
- Errors that occur when data is transmitted from one computer to another
- Software bugs or viruses
- Hardware malfunctions, such as disk crashes
- Natural disasters, such as fires and floods

There are many ways to minimize these threats to data integrity. These include:

- Backing up data regularly
- Controlling access to data via security mechanisms
- Designing user interfaces that prevent the input of invalid data
- Using error detection and correction software when transmitting data

2.12.1 HYPERTEXT

Text that has hyperlinks.When hypertext is viewed with an interactive browser, certain words appear as highlighted by underlining or color; clicking on a highlighted link leads to another location with more information about the subject.The term was invented by Ted Nelson.

2.12.2 MULTIMEDIA

Multimedia is communication that uses any combination of different media, and may or may not involve computers.Multimedia may include text, spoken audio, music, images, animation and video.The large amounts of data required for computer multimedia files makes CD-ROMs a good option for storage; but there are other ways of receiving multimedia communications, such as the World Wide Web.Multimedia programs are often interactive, and include games, sales presentations, encyclopedias, and more.

2.13.3 WIZARDS

An interactive help utility that guides the user through a potentially complex task, such as configuring a PPP driver to work with a new modem. Wizards are often implemented as a sequence of dialog boxes which the user can move forwards and backwards through, filling in the details required. The implication is that the expertise of a human wizard in one of the above senses is encapsulated in the software wizard, allowing the average user to perform expertly.

A utility within an application that helps you use the application to perform a particular task. For example, a "letter wizard" within a word processing application would lead you through the steps of producing different types of correspondence.

An enhancement to programs that makes them easier to operate by guiding you through, step by step, what is required to achieve your purpose.

2.14.5 TURING TEST

A criterion proposed by Alan Turing in 1950 for deciding whether a computer is intelligent. Turing called it "the Imitation Game" and offered it as a replacement for the question, "Can machines think?"

A human holds a written conversation on any topic with an unseen correspondent (nowadays it might be by electronic mail or chat). If the human believes he is talking to another human when he is really talking to a computer then the computer has passed the Turing test and is deemed to be intelligent.

Turing predicted that within 50 years (by the year 2000) technological progress would produce computing machines with a capacity of 10**9 bits, and that with such machinery, a computer program would be able to fool the average questioner for 5 minutes about 70% of the time.

The Loebner Prize is a competition to find a computer program which can pass an unrestricted Turing test.

2.14.6 ARTIFICIAL INTELLIGENCE

The subfield of computer science concerned with the concepts and methods of symbolic inference by computer and symbolic knowledge representation for use in making inferences. AI can be seen as an attempt to model aspects of human thought on computers. It is also sometimes defined as trying to solve by computer any problem that a human can solve faster.

Examples of AI problems are computer vision (building a system that can understand images as well as a human) and natural language processing (building a system that can understand and speak a human language as well as a human). These may appear to be modular, but all attempts so far (1993) to solve them have foundered on the amount of context information and "intelligence" they seem to require.

2.14.10 EXPERT SYSTEM

A computer program that contains a knowledge base and a set of algorithms or rules that infer new facts from knowledge and from incoming data.

An expert system is an artificial intelligence application that uses a knowledge base of human expertise to aid in solving problems. The degree of problem solving is based on the quality of the data and rules obtained from the human expert. Expert systems are designed to perform at a human expert level. In practice, they will perform both well below and well above that of an individual expert.

The expert system derives its answers by running the knowledge base through an inference engine, a software program that interacts with the user and processes the results from the rules and data in the knowledge base.
Expert systems are used in applications such as medical diagnosis, equipment repair, investment analysis, financial, estate and insurance planning, route scheduling for delivery vehicles, contract bidding, counseling for self-service customers, production control and training.

2.14.11 FUZZY LOGIC

A formal system of logic in which numbers on a scale from 0 to 1 are used instead of the values "true" and "false" as absolutes, to accurately represent the fact that some questions do not have a simple yes or no answer.Fuzzy logic was developed by Lofti Zadeh of the University of California, Berkeley.

A type of logic that recognizes more than simple true and false values. With fuzzy logic, propositions can be represented with degrees of truthfulness and falsehood. For example, the statement, *today is sunny*, might be 100% true if there are no clouds, 80% true if there are a few clouds, 50% true if it's hazy and 0% true if it rains all day.

Fuzzy logic has proved to be particularly useful in expert system and other artificial intelligence applications. It is also used in some spell checkers to suggest a list of probable words to replace a misspelled one.

Fuzzy logic seems closer to the way our brains work. We aggregate data and form a number of partial truths which we aggregate further into higher truths which in turn, when certain thresholds are exceeded, cause certain further results such as motor reaction. A similar kind of process is used in artificial computer neural networks and expert systems..

2.15.1 VIRTUAL REALITY

Computer simulations that use 3D graphics and devices such as the data glove to allow the user to interact with the simulation.

A form of network interaction incorporating aspects of role-playing games, interactive theater, improvisational comedy, and "true confessions" magazines. In a virtual reality forum (such as Usenet's alt.callahans newsgroup or the MUD experiments on Internet and elsewhere), interaction between the participants is written like a shared novel complete with scenery, "foreground characters" that may be personae utterly unlike the people who write them, and common "background characters" manipulable by all parties. The one iron

law is that you may not write irreversible changes to a character without the consent of the person who "owns" it, otherwise, anything goes.

Virtual reality, sometimes called VR, refers to computer simulations of real-world "environments" that use 3-D graphics and external devices like a dataglove or helmet to allow users to interact with the simulation. Users move through virtual reality environments as though they were navigating in real worlds -- walking through structures and interacting with objects in the environment.

An artificial environment created with computer hardware and software and presented to the user in such a way that it appears and feels like a real environment. To "enter" a virtual reality, a user dons special gloves, earphones, and goggles, all of which receive their input from the computer system. In this way, at least three of the five senses are controlled by the computer. In addition to feeding sensory input to the user, the devices also monitor the user's actions. The goggles, for example, track how the eyes move and respond accordingly by sending new video input.

To date, virtual reality systems require extremely expensive hardware and software and are confined mostly to research laboratories. The term *virtual reality* is sometimes used more generally to refer to any virtual world represented in a computer, even if it's just a text-based or graphical representation.

4.1.13 GROUPWARE

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