SECTION "A" – HARDWARE

Q. 2 (a)

Multimedia Technology:

The term multimedia recognizes that the technology represents a convergence of several information forms: Text, Still images, Audio Sequences, Motion video sequences and Animation sequences.

Effective Multimedia Uses:

(i) Marketing

Good communication and accurate information are essential ingredients in every sales process. Multimedia offers there plus additional capabilities – all aimed at guiding prospective customers in their selection and decision making process. Through the power of sound, video and animation, multimedia can also demonstrated how to use a product or service, including those that must be customized to the particular needs of the buyer prior to delivery.

(ii) Learning application

Multimedia learning systems are particularly effective when applied in fields where personal knowledge depends on accumulated experience. Today, educational institutions at all levels are experimenting with multimedia system designed to assist students to learn. Corporations are also using multimedia system so innovatively that they are revolutionizing employee training programs and producing high pay offs.

(iii) Computer games

The video games used today are multimedia products that are either delivered on a CD-ROM or diskette or built into a ROM-chip that are inserted into on arcade game.

Art and music are emerging as multimedia products for instance Microsoft Musical Instruments is an interactive journey into the world of musical instruments. Online books are also multimedia products that include cook books, medical anthologies and investment guides.

Q. 2 (b)

Registers are special-purpose, high-speed, temporary storage areas for instructions or data. They are not a part of memory: rather, they are special additional storage to cautions located within the CPU itself that offer the advantage of speed. Registers work under the direction of the control unit to accept, hold, and transfer instructions or data and perform arithmetic or logical comparison at high speed. The control unit uses a register the way a store owner uses a cash register-as a temporary. Convenient place to store what is used in transactions.

Special-purpose registers have specific tasks, such as holding the instruction that is currently being executed or keeping track of where the next instruction to be executed is stored in memory.

Registers hold data that is immediately related to the operation being executed. Memory stores data that will be used in the near further. Secondary storage holds data that may be needed later in the same program execution or perhaps at some time in the future.

Q. 2 (c)

USB Port:

Universal serial BUS is provided through a port on computer system unit. Devices with USB connectors can be daisy chaired to each other and plugged in to USB port, eliminating the need for multiple expansion cards. USB devices connect and disconnect without turning off the power of computer, low-powered devices can also draw power through the USB connection, eliminating the need for a separate power supply the newer USB version allows much higher data mates, and connect up to 127 devices to a computer.

Q.3 (a)

Here"s a brief look into the history of data storage.

Punch Cards:

Oldest known form of data storage is from 1725 and was done by Basile Bouchon when he used a perforated paper loop to store patterns that were to be used on cloth. But the first real patent for some kind

of data storage is dated back in 23 Sep 1884 by Herman Hollerith– an invention that was used for nearly 100 years until the mid 1970s.

Punched Tape:

The first known use of the paper tape was back in 1846 by Alexander Bain – the inventor of the fax machine and the electric printing telegraph. Each row on the tape represents one character, but since you easily could create a fanfold you could store significantly more data using the punched tape compared to the punch cards.

Magnetic Tape:

In the 1950s magnetic tapes was first used by IBM to store data on magnetic tape. Since one roll of magnetic tape could store as much data as 10 000 punch cards it became an instant success and became the most popular way of storing computer data until the mid 1980s.

Magnetic tape is a medium for magnetic recording generally consisting of a thin magnetizable coating on a long and narrow strip of plastic. Nearly all recording tape is of this type, whether used for recording audio or video or for computer data storage. It was originally developed in Germany, based on the concept of magnetic wire recording. A device that stores computer data on magnetic tape can be called a tape drive, a tape unit, or a streamer.

Magnetic tape has been used for data storage for over 50 years. In this time, many advances in tape formulation, packaging, and data density have been made. Modern magnetic tape is most commonly packaged in cartridges and cassettes. The device that performs actual writing or reading of data is a tape drive.

When storing large amounts of data, tape can be substantially less expensive than disk or other data storage options. Tape storage has always been used with large computer systems. Modern usage is primarily as a high capacity medium for backups and archives.

Magnetic Drum:

The magnetic drum was a 16 inch long drum spun that did 12,500 revolutions per minute. It was used to give the IBM 650 computer about 10 000 characters of main memory.

Magnetic Disk:

Magnetic disks are the most common form of secondary storage for your computer system. That's because they provide fast access and high storage capacities at a reasonable cost. Magnetic disk drives contain metal disks that are coated on both sides with an iron oxide recording material. Several disks are mounted together on a vertical shaft, which typically rotates the disks at speeds of 3,600 to 7,600 per minute (rpm). Electromagnetic read/write heads are positioned by access arms between the slightly separated disks to read and write data on concentric, circular tracks. Data are recorded on tracks in the form of tiny magnetized spots to form the binary digits of common computer codes. Thousands of bytes can be recorded on each track and there are several hundred data tracks on each disk surface, thus providing you with billions of storage positions for your software and data.

There are several types of magnetic disk arrangements, including removable disk cartridges as well as fixed disk units. Removable disk devices are popular because they are transportable and can be used to store backup copies of your data offline for convenience and security.

> **Floppy disks,** or magnetic diskettes, consist of polyester film disks covered with an iron oxide compound. A single disk is mounted and rotates freely inside a protective flexible or hard plastic jacket, which has access openings to accommodate the read/write head of a disk drive unit. The 3 1/2-inch floppy disk, with capacities of 1.44 megabytes, is the most widely used version, with a newer technology offering 120 megabytes of storage.
>
> **Hard disk drives** combine magnetic disks, access arms, and read/write heads into a sealed module. This allows higher speeds, greater data-recording densities, and closer tolerances within a sealed, more stable environment. Fixed or removable disk cartridge versions are available. Capacities of hard drives range from hundred megabytes to gigabytes of storage.

Optical storage, the typical Optical disc, stores information in deformities on the surface of a circular disc and reads this information by illuminating the surface with a laser diode and observing the reflection. Optical disc storage is *non-volatile*. The deformities may be permanent (read only media), formed once (write once media) or reversible (recordable or read/write media). Storage capacities of optical storage are far less than that of magnetic disks however optical storage media are far more reliable and durable and resilient to damage. They are also immune to magnetic fields unlike their magnetic counterparts.

The following forms are currently in common use:

- CD, CD-ROM, DVD, BD-ROM: Read only storage, used for mass distribution of digital information (music, video, computer programs)
- CD-R, DVD-R, DVD+R BD-R: Write once storage, used for tertiary and off-line storage
- CD-RW, DVD-RW, DVD+RW, DVD-RAM, BD-RE: Slow write, fast read storage, used for tertiary and off-line storage
- Ultra Density Optical or UDO is similar in capacity to BD-R or BD-RE and is slow write, fast read storage used for tertiary and off-line storage.

Q.3 (b)

(i) CMOS RAM

One important type of semiconductor design of RAM is Complementary Metal Oxide Semiconductor (CMOS). The design is noted for using relatively little electricity. In personal computer on use for CMOS is CMOS RAM, a small amount of memory that, thanks to battery power, retains data when the computer is shut off. Thus CMOS RAM can be used to store information your computer needs when it boots up such as time, data and hardware configuration data.

(ii) Pipeline Cache

Pipelining is a processing technique that feeds a new instruction into the CPU at every step of the processing cycle so that four or more instructions can be work on simultaneously.

(iii) Virtual Memory

It is a technique of memory management in which part of application program is stored on disk and is brought into memory only as needed. The secondary storage holding the rest of the program is considered virtual storage.

(iv) DIMM

It is an abbreviation for Duel-Inline Memory Module. The connecting pins on SIMM form a single set of contacts, while the DIMM boards have two sets of contacts, allowing for a wider data path and faster data transfer. The motherboard design determines the maximum amount of memory that you can install in your computer.

SECTION "B" – SOFTWARE

Q.4 (a)

(i) Batch processing

Batch processing, a widely used technique, involves the regular processing of large amounts of data. In batch processing, data is collected for a predetermined period of time, after which it is processed. The processing of payroll is a good example of batch processing. Payroll data is accumulated over a 1-, 2- or 4-week period and processed at regular intervals. Pay cheques are distributed to all employees on a predetermined schedule.

(ii) Multiprogramming

In a computer system with a multi-programmed operating system, several applications programs may be stored in main memory at the same time. The CPU, like the dentist, works on only one program at a time. When it reaches a point in a program at which peripheral devices or other elements of the computer system must take over some of the work, the CPU interrupts processing to move on to another program, returning to the first program when that program is ready to be processed again. While the computer is waiting on data for one program to be accessed on disk, for example it can perform calculations for another program. The systems software for the disk unit works like the dental assistants it does background work; in this case, retrieving the data stored on disk.

(iii) Multiprocessing

It refers to the use of two or more computers linked together to perform work at the same time. This, of course, often requires systems software that will realize multiple CPUs are in use and has the ability to assign work to them as efficiently as possible. While multiprogramming involves processing several programs or tasks concurrently on a single computer, multiprocessing involves handling multiple programs or tasks simultaneously (at precisely the same instant) on several computers. There are many ways to implement multiprocessing, two common ones are co-processing and parallel processing.

(iv) Timesharing

It is a very popular technique for computer systems that support numerous terminals. The operating system cycles through all the active programs in the system that need processing and gives each one a small time slice on each cycle.

Q.4 (b)

Backup procedure:

A procedure that describes how and when to make extra copies of information or software to protect against losses.

Recovery procedure:

A recovery procedure is an action taken when information of software must be restored.

The information which is lost or accidently changed can be restored from the backup copy. A backup server may be used with an on-line system which continuously makes backup through "Mirroring" process on the hard disk in order to handle any future disaster.

As for as recovery procedure is concerned several software are being sold in the market, available on CDs which are used to recover the data if lost by mistake or deliberately.

Q.5 (a)

Pre-written Software:

Thousands of pre-written software packages are available today. If you can find a software package that meets your requirements, purchasing it is the best option.

Buying Pre-written Software:

Following steps are followed in selecting and buying a pre-written software package:

1- Prepare a list of all available software packages that can perform the desired task(s).

2- From this list, select those software packages only that meet the system specification. For example, compatibility with user's available/ planned hardware, I/O devices, Operating System, etc.

3- Now choose the best one (based on factors such as supported features, duration of warranty support, cost, etc.) from the list of those selected in Step 2.

4- Now find out the source from where you can purchase the finally selected software at the cheapest price. Different vendors normally offer different discount rates on the list price, and selecting the best vendor in terms or price and after-sale support is very important.

Following are the advantages and limitations of buying a pre-written software package:

1- Pre-written software packages usually cost less because many customers share their development and maintenance cost.

2- With a pre-written software package, a user can start the planned activity almost immediately. The user need not wait for the software to be developed and tested. This may be very important, if the development and testing efforts involve several months.

3- Pre-written software packages are usually general purpose, so that they can meet the requirements of as many potential users as possible. Due to this, many times, the operating efficiency and capability of meet the specific needs of a user more effective is not as good for pre-written software packages as for in-house developed software packages.

Customized Software:

In none of the available pre-written software packages meet the specific requirements of a user (an organization or an individual), it becomes necessary for the user to create a customized software package. If the user has an in-house software development team, the software package can be created in-house. However, if such a team does not exist in-house, the user must get it created by another organization by placing an order for it.

Ordering Customized Software:

Following steps are followed for this:

1- The user prepares a list of all user requirements carefully.

2- The user then floats a tender for inviting quotations for creation of the requisite software. Sometimes, the user directly contacts few software houses instead of floating a tender for quotations.

3- After receiving the quotations, the user selects a few of them for further interaction based on the cost quoted by them, their reputation in the market, their submitted proposal, etc.

4- The user then personally interacts with the representative(s) of each of the selected vendors. Based on this interaction, the user makes a final choice of the vendor to offer the contract for creation of the requisite software.

5- The selected vendor then creates the software packages and delivers it to the user. Often, the vendor has to interact closely with the user during the software development process.

Often, the user has to order for both hardware and software. In this case, the user may choose to place the order for both to a single vendor. The vendor develops the software on the chosen hardware, and delivers the software along with the hardware to the user. This is normally referred to as an *end-to-end solution* or a *turnkey solution.*

Following are the advantages and limitations of ordering a customized software package rather than developing it in-house.

1- The user need not maintain its own software development team. Maintaining and managing such a team is expensive, and may not be justified for an organization not needing to develop software on a regular basis.

2- It is easier to carry out changes in the software, if an in-house team develops it. For ordered customized software, the user needs to depend always on the vendor for carrying out the changes, and the vendor may charge separately for every request for change.

Q.5 (b)

Documentation:

Documentation is the process of collecting, organizing, storing, and maintaining a complete historical record of programs and other documents used or prepared during the different phases of the life cycle of software. Any software cannot be considered complete until it is properly documented. In fact, documentation is an on-going process that starts as early as in the study phase of the software and continues until its implementation and operation phase. Moreover, documentation is a never-ending process throughout the life of the software. It has to be carried out from time-to-time whenever the soft ware is modified during its maintenance phase.

Need for Documentation:

Proper documentation of software is necessary due to the following reasons:

1- It solves the problem of indispensability of an individual for an organization. Even if the designer or programmer of the software leaves the organization, the documented knowledge remains with the organization that is useful for the continuity of the software.

2- It makes software easier to modify and maintain in the future. The key to maintenance is proper and dynamic documentation. It is easier to understand the logic of a program from the documented records rather than its code. System flowcharts, program flowcharts, or comments used within the programs prove to be very helpful in this regard.

3- It helps in restarting a software postponed earlier due to some reason. The job need not start from scratch, and the old ideas can be easily recapitulated from the available documents, avoiding duplication of work, and saving lot of time and effort.

SECTION "C" – NETWORK & SECURITY

Q 6 (a)

(i) Firewalls:

A firewall is an integrated collection of security measures designed to prevent unauthorized electronic access to a networked computer system. It is also a device or set of devices configured to permit, deny,

encrypt, decrypt, or proxy all computer traffic between different security domains based upon a set of rules and other criteria.

A system designed to prevent unauthorized access to or from a private network. Firewalls can be implemented in both hardware and software, or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially intranets. All messages entering or leaving the intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria.

(ii) Digital signatures:

A digital signature or digital signature scheme is a type of asymmetric cryptography used to simulate the security properties of a handwritten signature on paper. Digital signature schemes normally give two algorithms, one for signing which involves the user's secret or private key, and one for verifying signatures which involves the user's public key. The output of the signature process is called the "digital signature."

A signature provides authentication of a "message". Messages may be anything, from electronic mail to a contract, or even a message sent in a more complicated cryptographic protocol. Digital signatures are used to create public key infrastructure (PKI) scheme in which user's public key (whether for public-key encryption, digital signatures, or any other purpose) is tied to a user by a digital identity certificate authority. PKI schemes attempt to unbreakably bind user information (name, address, phone number, etc.) to a public key, so that public keys can be used as a form of identification.

Digital signatures can also provide non-repudiation, meaning that the signer cannot successfully claim they did not sign a message, while also claiming their private key remains secret; further, some non-repudiation schemes offer a time stamp for the digital signature, so that even if the private key is exposed, the signature is valid nonetheless. Digital signatures are often used to implement electronic signatures, a broader term that refers to any electronic data that carries the intent of a signature, but not all electronic signatures use digital signatures.

(iii) Authentication and authorization:

Authentication is the process of determining whether someone or something is, in fact, who or what it is declared to be. In private and public computer networks (including the Internet), authentication is commonly done through the use of logon passwords. Knowledge of the password is assumed to guarantee that the user is authentic. Each user registers initially (or is registered by someone else), using an assigned or self-declared password. On each subsequent use, the user must know and use the previously declared password. The weakness in this system for transactions that are significant (such as the exchange of money) is that password can often be stolen, accidentally revealed, or forgotten.

For this reason, Internet business and many other transactions require a more stringent authentication process. The use of digital certificates issued and verified by a Certificate Authority (CA) as part of a public key infrastructure is considered likely to become the standard way to perform authentication on the Internet. Logically, authentication precedes authorization (although they may often seem to be combined).

Authorization is the process of giving someone permission to do or have something. In multi-user computer systems, a system administrator defines for the system which users are allowed access to the system and what privileges of use (such as access to which file directories, hours of access, amount of allocated storage space, and so forth). Assuming that someone has logged in to a computer operating system or application, the system or application may want to identify what resources the user can be given during this session. Thus, authorization is sometimes seen as both the preliminary setting up of permissions by a system administrator and the actual checking of the permission values that have been set up when a user is getting access. Logically, authorization is preceded by authentication.

Q 6 (b)

(i) Wide Area Network (WAN):

A wide area network or WAN is a computer network covering a broad geographical area. Contrast with personal area networks (PANs), metropolitan area networks (MANs) or local area networks (LANs) that are usually limited to a room, building or campus. The largest and most well-known example of a WAN is the Internet.

WANs are used to connect local area networks (LANs) together, so that users and computers in one location can communicate with users and computers in other locations. Many WANs are built for one particular organization and are private. Others, built by Internet service providers, provide connections

from an organization's LAN to the Internet. WANs are most often built using leased lines. At each end of the leased line, a router connects to the LAN on one side and a hub within the WAN on the other. Leased lines can be very expensive. Instead of using leased lines, WANs can also be built using less costly circuit switching or packet switching methods.

(ii) Metropolitan Area Network (MAN):

Metropolitan Area Networks or MANs are large computer networks usually spanning a campus or a city. They typically use wireless infrastructure or optical fiber connections to link their sites.

For instance a university or college may have a MAN that joins together many of their local area networks (LANs) situated around site from their MAN they could have several wide area network (WAN) links to other universities or the Internet. Specifically, this type of MAN is known as a campus area network.

Some technologies used for this purpose are ATM, FDDI and SMDS. These older technologies are in the process of being displaced by Ethernet-based MANs (e.g. Metro Ethernet) in most areas. MAN links between LANs have been built without cables using microwave, radio, or infra-red free-space optical communication links. Distributed Queue Dual Bus, is the Metropolitan Area Network standard for data communication

(iii) Hybrid Networks:

Hybrid networks are part star, part ring, and part bus. These structures are common in very large networks, especially those that developed over a long period of time.

Point to point connections (for just two computers) and meshes (many point-to-point connections) are two other topologies. The first is of little interest since a few LANs are of this type. The second is not supported with current LAN software on personal computers.

Networks can be configured in several ways. Hub or Star networks, the simplest to develop, pass all communications through a single switch or node. Multidrop network (see figure 1) connect all devices to a single meandering set of links. These are inexpensive, full-time networks, but loss of service at any point will immediately deny access to those further along the network.

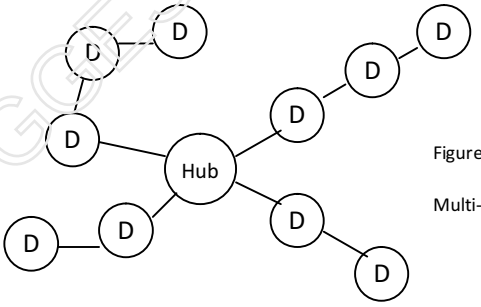

Figure 1

Multi-drop

Loop or ring networks from an endless loop, they also are relatively inexpensive, and can provide an alternate route in case of loss of service at a given point. Mesh networks (see figure 2) permit any two devices within the network to communicate directly. This type of configuration is very dependable, since it provides multiple routes into and out of each location.

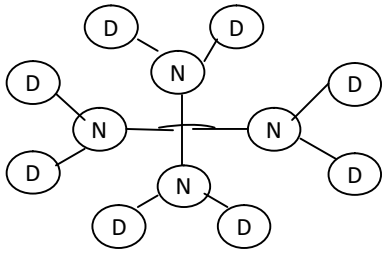

Figure 2

Mesh

Q 6 (c)

(i) Half Duplex:

A half duplex system provides for communication in both directions, but only one direction at a time (not simultaneously). Typically, once a party begins receiving a signal, it must wait for the transmitter to stop transmitting, before replying.

An example of a half duplex system is a two-party system such as a "walkie-talkie" style two-way radio, wherein one must use "Over" or anther previously designed command to indicate the end of transmission, and ensure that only one party transmits at a time, because both parties transmit on the same frequency.

A good analogy for a half duplex system would be a one lane road with traffic controllers at each end. Traffic can flow in both directions, but only one direction at a time with this being regulated by the traffic controllers.

(ii) Full Duplex:

A full duplex, or sometimes double-duplex system allows communication in both directions, and unlike half duplex, allows this to happen simultaneously. Landline telephone networks are full duplex since they allow both callers to speak and be heard at the same time. A good analogy for a full duplex system would be a two-lane road with one lane for each direction.

Examples: Telephones, Mobile phones etc.

Two way radios can be, for instance, designed as full duplex systems, which transmit on one frequency and receive on a different frequency. This is also called frequency-division duplex. Frequency-division-duplex systems can be extended to farther distances using pairs of simple repeater stations, because the communications transmitted on any one frequency always travel in the same direction.

THE END