Long Question:

1. Explain the major functions of Digital Computers.

A computer is a programmable electronic machine. It takes raw facts as input, process these and gives the final output which is the result of processing. It responds to a specific set of instructions in a well-defined manner. It can execute a prerecorded list of instructions (a program). Digital computers can be classified by their size and power as follows:

- Super Computers
- Mainframe Computers
- Mini Computers
- Work Stations
- Micro Computers/ Personal Computer

To function properly, the computer needs both hardware and software. Hardware consists of the mechanical and electronic devices, which we can see and touch. The different parts of the computer are Processor (CPU), Input devices, Output devices, Storage devices and Memory devices. The software consists of programs, the operating systems and the data that reside in the memory and storage devices.

A typical digital computer system has four basic functional elements:

- input-output equipment
- main memory
- control unit
- arithmetic-logic unit

Any of a number of devices is used to enter data and program instructions into a computer and to gain access to the results of the processing operation. Common input devices include keyboards and optical scanners; output devices include printers and cathode-ray tube and liquid-crystal display monitors. The information received by a computer from its input unit is stored in the main memory or, if not for immediate use, in an auxiliary storage device. The control unit selects and calls up instructions from the memory in appropriate sequence and relays the proper commands to the appropriate unit. It also synchronizes the varied operating speeds of the input and output devices to that of the arithmetic-logic unit (ALU) so as to ensure the proper movement of data through the entire computer system. The ALU performs the arithmetic and logic algorithms selected to process the incoming data at extremely high speeds-in many cases in nanoseconds (billionths of a second). The main memory, control unit, and ALU together make up the central processing unit (CPU) of most digital computer systems, while the input-output devices and auxiliary storage units constitute peripheral equipment.

2. Explain the first, second and third normal form and compare it.

Normalization is the process of building database structures to store data. Normalization is a formal process of developing data structures in a manner that eliminates redundancy and promotes integrity. Data normalization is a corner stone of the relational theory. In relational database design, the process of organizing data to minimize redundancy is called normalization. Normalization usually involves dividing a database into two or more tables and defining relationships between the tables. The objective is to isolate data so that additions, deletions, and

modifications of a field can be made in just one table and then propagated through the rest of the database via the defined relationships.

There are three main normal forms, each with increasing levels of normalization:

- *First Normal Form (1NF):* Each field in a table contains different information. For example, in an employee list, each table would contain only one birth date field. First normal form deals with the "shape" of a record type. Under first normal form, all occurrences of a record type must contain the same number of fields. First normal form excludes variable repeating fields and groups. This is not so much a design guideline as a matter of definition. Relational database theory doesn't deal with records having a variable number of fields.
- *Second Normal Form (2NF):* Each field in a table that is not a determiner of the contents of another field must itself be a function of the other fields in the table. Second normal form is violated when a non-key field is a fact about a subset of a key. It is only relevant when the key is composite, i.e., consists of several fields.
- *Third Normal Form (3NF):* No duplicate information is permitted. So, for example, if two tables both require a birthdate field, the birthdate information would be separated into a separate table, and the two other tables would then access the birthdate information via an index field in the birthdate table. Any change to a birthdate would automatically be reflecting in all tables that link to the birthdate table. Third normal form is violated when a non-key field is a fact about another non-key field.

There are additional normalization levels, such as *Boyce Codd Normal Form (BCNF), fourth normal form (4NF)* and *fifth normal form (5NF)*. While normalization makes databases more efficient to maintain, they can also make them more complex because data is separated into so many different tables.

3. What do you mean by Intranet? Explain the advantages and disadvantages of Intranet.

Commonly used in different types of organizations, an intranet is very similar to an Internet, but the difference is that an intranet is local, while the Internet is global. In other words, an intranet (a secure information-sharing system) uses data stored on an internal corporate network, while the Internet uses data stored on the servers all around the world. The purpose of an intranet differs according to the type of organization where it is implemented. An intranet implements many technologies known from the Internet, such as file transfer protocols, chat rooms, browser interfaces, and many others. Furthermore, not all users have access to all the data stored on a central server; this depends on the privileges and rank of each employee within the organization. It's also relevant that many organizations have a number of computers and routers already implemented. Therefore, an intranet can be considered as an extension to a network infrastructure that already exists within the organization.

Advantages of an Intranet: There are numerous benefits of an intranet. One of the most important benefits concerns the security of the information. If maintained and administered well, an intranet can provide encrypted access to highly sensitive information. This information is not transferred through the open networks but is available only to people inside the organization that have the required privileges. An intranet also provides a quality and secure communication between employees, it uses well known e-mail clients and Internet browsers, and it can be

implemented easily on an existing infrastructure. Some other advantages are its flexibility and scalability as well as the access it provides to accurate information. It also provides new business opportunities, since a company can create an extranet (a network of intranets of different organizations) and share sensitive information easily with its clients.

- Security from outside users
- Relatively cheap to set up
- Quick access to information
- Easy and cheap to post information
- Increase in productivity

Disadvantages of an Intranet: Every network concept has disadvantages. Naturally, the security risks come first. This does not concern only the software security issues, but also the way employees handle their user names and passwords. Sometimes, these passwords are left on a place where anyone can see them, while users also tend to choose simple passwords that are easy to guess (for example, date of birth, initials, children's names, etc). Some companies are not comfortable with this method of file and information sharing, and this technology brings additional costs as well. Although one purpose of an intranet is to ease the process of communication and file sharing within the organization, some employees who are not comfortable with computer technology might be frustrated and confused with this method.

- Security from within
- New budget
- Cost of training
- Cost of maintaining
- Separate software might be needed for internet and e-mail

Short Questions:

4. What do you mean by the speed of a computer?

Computers have numerous specifications, measured in capacities or speeds. Storage devices are measured by how much data they can store and how fast the data can be accessed. Other components also have to access data, and can be measured by how fast that access occurs and often how fast it can perform functions with that data. The general term, computer speed, refers to CPU clock speed. This is how fast the CPU operates, usually measured in gigahertz (GHz). One gigahertz is equal to 1 billion hertz, or cycles per second. So a 1 GHz computer has a CPU that operates at 1 billion cycles per second. Operating at 1 GHz does not mean a computer can do 1 billion operations every second. Different CPUs use different instructions that affect how many cycles it takes to complete an operation or how many operations can be completed in one cycle. So two different CPUs might not operate practically at the same speed even if their clock speeds are identical.

5. What do you mean by super computer?

Super computers are the computers with the most processing power. The primary application of supercomputers has been in scientific and military work, but their use is growing in business as their prices decreases. They are especially valuable for large simulation models of real world phenomena, where complex mathematical representations and calculations are required or for image creation and processing. They are also used in weather prediction, design aircraft (Boeing 777), motion picture like star wars and Jurassic Park). They operate generally at 4 to 10 times faster than the next most powerful computer class; the mainframe computers.
Advantages: Speed, amount of things that can run at once without it slowing down, better graphics capabilities for gaming and graphics designing, and smoother performance.
Disadvantages: Power usage, heat, cost and in the case of overclocked computers heat that leads to damage to the components which in turn will raise the cost through replacement parts. In the case of 64 bit processors, (which can provide better processing capabilities) there can be the downside of compatibility issues for some software.

6. What is an auxiliary storage device?

Auxiliary storage units behave in a manner similar to other I/O devices, but users do not interact directly with them. If you were to place yourself inside the computer, in many ways you would not be able to distinguish among the various kinds of I/O equipment. Auxiliary storage equipment has data transmission rates that may be significantly higher than other I/O devices but are still much slower than the internal speeds of the processor. Auxiliary storage serves two main purposes: it serves as an extension of the main memory or as a medium to permanently archive information. The computer can use it as a memory extension for its own purposes outside the control of the user. On the other hand, the user can employ the extra storage to maintain almost limitless information. Some of the auxiliary storage devices are: Hard Disk, Optical Disk, Magnetic Tape, and Floppy Disk.

7. What are the different types of software?

Software is a collection of set of programs, which are used to execute all kinds of specific instruction. It consists of a number of machine instructions, array in a specific order to perform a particular task. Software is used to describe all the programs and its associated documents which run on a computer. Software means computer instructions or data. Anything that can be stored electronically is software. Firmware is software (programs or data) that has been permanently written onto read-only memory (ROM). All software falls into two general types or categories: System Software and Application Software. *System software* consists of low-level programs that interact with the computer at very basic level. This includes operating systems, compilers, and utilities for managing resources. On the other hand, *Application software* includes database programs, word processors, and spreadsheets.

8. What do you mean by multitasking?

Multitasking is the ability to execute more than one task at the same time, a task being a program. The terms multitasking and multiprocessing are often used interchangeably, although multiprocessing implies that more than one CPU is involved. In multitasking, only one CPU is involved, but it switches from one program to another so quickly that it gives the appearance of

executing all of the programs at the same time. There are two basic types of multitasking: *preemptive* and *cooperative.* In preemptive multitasking, the operating system parcels out CPU time slices to each program. In cooperative multitasking, each program can control the CPU for as long as it needs it. If a program is not using the CPU, however, it can allow another program to use it temporarily. OS/2, Windows 95, Windows NT, the Amiga operating system and UNIX use preemptive multitasking, whereas Microsoft Windows 3.x and the MultiFinder (for Macintosh computers) use cooperative multitasking.

9. Differentiate between high level language and low level language.

The differences between high level language and low level languages are pointed out below:

- *Learning:* High level languages are easy to learn whereas Low level languages are difficult to learn.
- *Understanding:* High level languages are near to human languages whereas Low level languages are far from human languages.
- *Execution:* Programs in high level languages are slow in execution whereas programs in low level languages are fast in execution.
- *Modification:* Programs in high level languages are easy to modify whereas programs in low level languages are difficult to modify.
- *Facility at hardware level:* High level languages do not provide much facility at hardware level whereas Low level languages provide facility to write programs at hardware level.
- *Knowledge of hardware Deep:* Knowledge of hardware is not required to write programs in high level language whereas in low level language deep knowledge of hardware is required to write programs.
- *Uses:* High level languages are normally used to write application programs whereas Low level languages are normally used to write hardware programs.

10. What are the advantages of using a database?

The advantages of using a database are as follows:

- *Reduction in data redundancy:* Redundancy can be controlled using DBMS. Thus, space is efficiently used. The existing applications can share the data in the database. Reduces problem of inconsistencies in stored information, e.g. different addresses in different departments for the same customer.
- *Maintenance of data integrity and quality:* Integrity means that the data in the database is accurate. Centralized control of the data helps in permitting the administrator to define integrity constraints to the data in the database.
- *Data are self-documented or self-descriptive:* Information on the meaning or interpretation of the data can be stored in the database, e.g. names of items, metadata.
- *Avoidance of inconsistencies:* Reducing the redundancy also avoids the inconsistency of data. Data must follow prescribed models, rules, standards.
- *Security restrictions :* With complete authority over the operational data, the database administrator can ensure that the only means of access to the database is through proper channels. He can define authorization checks to be carried out whenever access to sensitive data is attempted. Different checks can be established for each type of access (retrieve, modify, delete, etc). to each piece of information in the database.

11. What are the different types of network architectures?

Network architecture refers to the layout of the network, consisting of the hardware, software, connectivity, communication protocols and mode of transmission, such as wired or wireless. Network architectures are classified into two broad categories: client-server architectures, peer-to-peer architectures.

In the *client-server architectural model*, a system is decomposed into client and server processors or processes. Servers provide computational resources (or services), which clients consume. Typically a server provides services to many clients. It is also common for clients to consume services from multiple services. Stated otherwise, there is generally a 1:M relationship between a server and its clients, and it is sometimes the case that there is a 1:M relationship between a client and the servers that it uses. Client-server architectures are commonly organized into layers referred to as "tiers". In a *peer-to-peer architecture model*, a system is decomposed into computational nodes that have equivalent capabilities and responsibilities. This division is in contrast to a client-server architectural model, where client and server nodes are divided into server and client roles. An example of a peer-to-peer architecture is a system of intelligent agents that collaborate to collect, filter, and correlate information.

12. How can you define the addresses on the Internet?

A unique numeric identifier, divided into four octets, assigned to machines on the Internet or an intranet is called internet address. This 32-bit numerical address is used so machines can identify and locate each other for the purpose of sending and receiving data. Internet address is either the address of a webpage or a website, or an email address. The proper name for a website address is Uniform Resource Locator (URL). An internet address uniquely identifies a node on the Internet. Internet address may also refer to the name or IP of a website (URL). The term Internet address can also represent someone's e-mail address. The format for addressing a message to an Internet user is USER NAME @ DOMAIN NAME. For example, the address of the solution maker of this subject is *sulav@csitnepal.com*. There are no spaces between any of the words. SULAV is the user name and CSITNEPAL.COM is the domain name. The .COM stands for the commercial top level domain category.

13. What are the components of a data warehouse?

The primary components of data warehouse are as follows:

- *Data sources:* It refers to any electronic repository of information where data is passed from these systems to the data warehouse either on a transaction by transaction basis for real-time data warehouses or on a regular cycle.
- *Data transformation:* This layer receives data from the data sources, cleans and standardizes it, and loads it into the data repository.
- *Reporting:* The data in the data warehouse must be available to all the users if the data warehouse is to be useful.
- *Metadata:* Metadata or "data about data", is used to inform users of the data warehouse about its status and the information held within the data warehouse.
- *Operations:* Data warehouse operations comprises of the processes of loading, manipulating and extracting data from the data warehouse. Operations also cover user management, security, and capacity management.
- *Optional components:* In addition, the following components also exist in some data warehouses: dependent data marts, logical data marts, and operational data store.