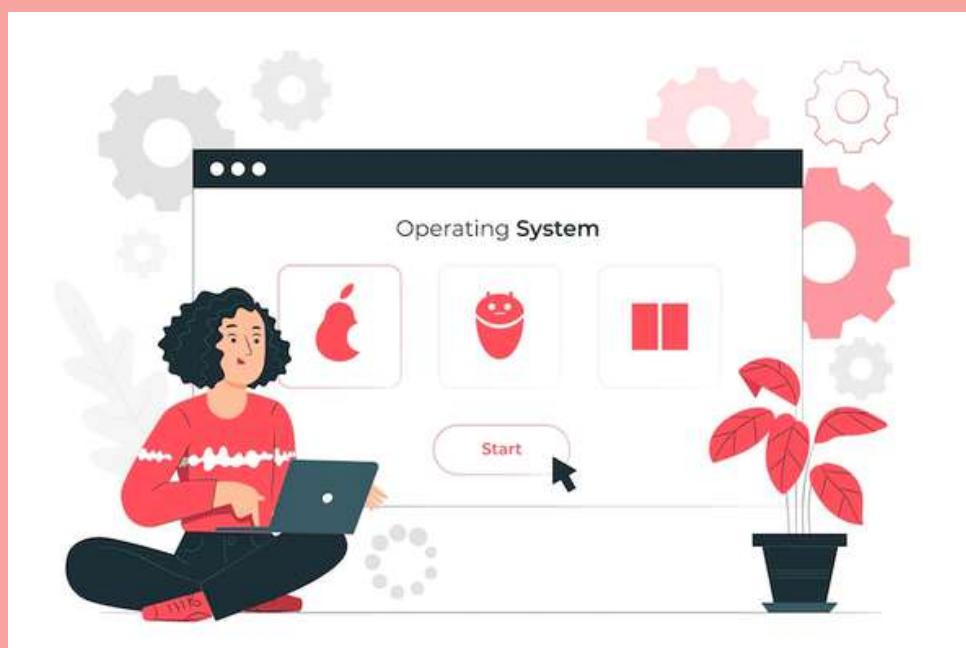


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OPERATING SYSTEMS

PHASE-II STUDY NOTES
FOR NABARD GR. A IT OFFICER EXAM



Operating Systems

Phase-II Study Notes for NABARD Gr. A IT Officer Exam

What is an Operating System?

- An operating system is the most important software that runs on a computer.
- An Operating System (OS) is software that acts as an interface between computer hardware components and the user.
- It manages the computer's memory and processes, as well as all of its software and hardware.
- It also allows you to communicate with the computer without knowing how to speak the computer's language.
- Every computer system must have at least one operating system to run other programs.
- Applications like Browsers, MS Office, Notepad Games, etc., need some environment to run and perform their tasks.
- The OS helps you to communicate with the computer without knowing how to speak the computer's language.
- It is not possible for the user to use any computer or mobile device without having an operating system.
- Without an operating system, a computer is useless.

Types of Operating Systems

- Operating systems usually come pre-loaded on any computer you buy. Most people use the operating system that comes with their computer, but it's possible to upgrade or even change operating systems.
- The three most common operating systems for personal computers are Microsoft Windows, macOS, and Linux.
- Modern operating systems use a graphical user interface, or GUI (pronounced gooey).

- A GUI lets you use your mouse to click icons, buttons, and menus, and everything is clearly displayed on the screen using a combination of graphics and text.
- An Operating System (OS) is an interface between a computer user and computer hardware.
- An operating system is software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers.
- Some popular Operating Systems include Linux Operating System, Windows Operating System, VMS, OS/400, AIX, z/OS, etc.

Functions of an Operating System

1. Memory Management

- Memory management refers to the management of primary memory or main memory.
- Main memory is a large array of words or bytes where each word or byte has its own address.
- Main memory provides fast storage that can be accessed directly by the CPU. For a program to be executed, it must be in the main memory.
- An Operating System does the following activities for memory management –Keeps track of primary memory, i.e., what parts of it is in use by whom, and what part are not in use.
- In multiprogramming, the OS decides which process will get memory when and how much.
- Allocates the memory when a process requests it to do so.
- De-allocates the memory when a process no longer needs it or has been terminated.

2. Processor Management

- In a multiprogramming environment, the OS decides which process gets the processor when and for how much time. This function is called process scheduling.

- An Operating System does the following activities for processor management –Keeps track of the processor and the status of the process. The program responsible for this task is known as the traffic controller.
- Allocates the processor (CPU) to a process.
- De-allocates processor when a process is no longer required.

3. Device Management

- An Operating System manages device communication via their respective drivers. It does the following activities for device management –Keeps track of all devices.
- The program responsible for this task is known as the I/O controller.
- Decides which process gets the device when and for how much time.
- Allocates the device in an efficient way.
- De-allocates devices.

4. File Management

- A file system is normally organized into directories for easy navigation and usage. These directories may contain files and other directions.
- An Operating System does the following activities for file management –Keeps track of information, location, uses, status etc. The collective facilities are often known as file systems.
- Decides who gets the resources.
- Allocates the resources.
- De-allocates the resources.

5. **Security:** By means of passwords and similar other techniques, it prevents unauthorized access to programs and data.

6. Control over System Performance: Recording delays between requests for service and responses from the system.

7. Job Accounting: Keeping track of time and resources used by various jobs and users.

8. Error Detecting Aids: Production of dumps, traces, error messages, and other debugging and error detecting aids.

9. Coordination between other software and users: Coordination and assignment of compilers, interpreters, assemblers, and other software to the various users of the computer systems.

Types of Operating System (OS)

Following are the popular types of OS (Operating System):

1. Batch Operating System

- Some computer processes are very lengthy and time-consuming.
- To speed the same process, a job with a similar type of needs is batched together and run as a group.
- The user of a batch operating system never directly interacts with the computer.
- In this type of OS, every user prepares his or her job on an offline device like a punch card and submits it to the computer operator.

2. Multitasking/Time Sharing OS

- The time-sharing operating system enables people located at a different terminal(shell) to use a single computer system at the same time.
- The processor time (CPU) which is shared among multiple users is termed time sharing.

3. Multiprocessing OS: Multiprocessing system means, there are more than one processor which work parallel to perform the required operations. It allows the multiple processors, and they are connected with physical memory, computer buses, clocks, and peripheral devices.

4. Real-Time OS

- A real-time operating system's time interval to process and respond to inputs is very small.
- Examples: Military Software Systems and Space Software Systems are the Real-time OS example.

5. **Distributed OS:** Distributed systems use many processors located in different machines to provide very fast computation to their users.

6. **Network OS:** Network Operating System runs on a server. It provides the capability to serve to manage data, users, groups, security, application, and other networking functions.

7. **Mobile OS:** Mobile operating systems are those OS which are especially designed to power smartphones, tablets, and wearables devices.

Functions of Operating System

Some typical operating system functions may include managing memory, files, processes, I/O system & devices, security, etc.

Main Functions of the Operating System

1. **Process Management:** Process management helps OS to create and delete processes. It also provides mechanisms for synchronization and communication among processes.

2. **Memory Management:** The memory management module performs the task of allocation and de-allocation of memory space to programs in need of these resources.

3. **File Management:** It manages all the file-related activities such as organization storage, retrieval, naming, sharing, and protection of files.

4. **Device Management:** Device management keeps track of all devices. This module also responsible for this task is known as the I/O controller. It also performs the task of allocation and de-allocation of the devices.

5. I/O System Management: One of the main objects of any OS is to hide the peculiarities of that hardware device from the user.

6. Secondary-Storage Management: Systems have several levels of storage which include primary storage, secondary storage, and cache storage. Instructions and data must be stored in primary storage or cache so that a running program can reference them.

7. Security: The security module protects the data and information of a computer system against malware threats and authorized access.

8. Command Interpretation: This module is interpreting commands given by the acting system resources to process those commands.

9. Networking: A distributed system is a group of processors which do not share a memory, hardware devices, or a clock. The processors communicate with one another through the network.

10. Job Accounting: Keeping track of time & resources used by various jobs and users.

11. Communication Management: Coordination and assignment of compilers, interpreters, and other software resource of the various users of the computer systems.

Features of Operating System (OS)

Here is a list of important features of OS:

- Protected and supervisor mode
- Allows disk access and file systems device drivers networking security
- Program Execution
- Memory management Virtual Memory Multitasking
- Handling I/O operations
- Manipulation of the file system

- Error Detection and handling
- Resource allocation
- Information and Resource Protection

Advantages of Operating System

- Allows you to hide details of hardware by creating an abstraction.
- Easy to use with a GUI.
- Offers an environment in which a user may execute programs/applications
- The operating system must make sure that the computer system is convenient to use
- Operating System acts as an intermediary among applications and the hardware components
- It provides the computer system resources with easy to use the format
- Acts as an mediator between all hardware and software of the system

Disadvantages of Operating System

- If any issue occurs in OS, you may lose all the contents which have been stored in your system
- Operating system software is quite expensive for small size organizations which adds a burden on them. Example Windows
- It is never entirely secure as a threat can occur at any time.

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COMPUTER FUNDAMENTALS

**PHASE-II STUDY NOTES
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FOR NABARD GR. A IT OFFICER EXAM

Computer Fundamentals

Phase-II Study Notes

For NABARD Gr. A IT Officer Exam

Introduction

- It can be described as the learning or studying some basic functions of computers starting from their origin to the modern day.
- Study of basic computer types to their characteristics, advantages and disadvantages are included in the Learning of fundamentals of computers.
- Before shifting to advance computer knowledge, it is highly recommended to be aware of this topic thoroughly as it would make you more confident and comfortable while acquiring more advanced computer skills.
- A computer can be defined or described as a machine or device which can work with information such as to store, retrieve, manipulate, and process data.
- The term computer is derived from the word “computare”.
- The word is derived from a “Latin” word which means to calculate.
- A computer can be further defined as a programmable machine that is used for numerical calculations.
- Some years back these devices machines were used only for the purpose of calculations but presently they are widely and proudly used in all sections of human society.
- Modern computers are incredibly advanced thanks to the new up-gradation and enhancement of technologies.
- They can store huge amounts of data in internal as well as external storage units.
- A computer's hard disk is the external source of storing data.
- These days computer speed has dramatically increased the work or task which used to take long hours to perform can be done in few seconds this is because of the rapid development in the IT [Information Technology] sector especially in the computer hardware section.

- The computer peripherals and devices manufactured these days are of the highest quality at an affordable price.
- The technology has made these devices perform more speedily than ever before also this is the important characteristics of a computer system which made them very famous and a part of human lives.
- It has also been observed that the life of modern peripherals and devices has been extended due to the excellent quality of raw material used while preparations of these devices.

Speed of a Computer

The Speed of a computer mainly and primarily depends upon some factors such as the type of motherboard you are using, processor speed and RAM [Random Access Memory].

Motherboard: Computer where all other components are attached to it such as hard disk, processor, ram, etc. The motherboard is designed on a piece of PCB which is called a Printed Circuit Board.

Processor: The processor is again called CPU which stands for Central Processing Unit. It is also called as Heart Brain of the Computer System.

RAM: RAM stands for Random Access Memory which is a temporary storage medium and its volatile memory. They tend to lose data when power is off. However, the speed of the computer depends upon RAM as well.

Hard Disk: This is a permanent storage unit of a computer which can store data in high volume and also you can retrieve data whenever and wherever you need it.

Disadvantages of Computer System

As there are numerous advantages of using a modern-day personal computer there are disadvantages too:

- Spread of pornography
- Hate & violence related articles
- Cyber Crimes
- Negative Effects on Health

Computer Software and Hardware

Computer software can be described as a collection of small programs that are programmed in such a way which are capable of performing specific and special tasks whenever desired.

These types of software are developed by computer programmers or software developers who take care of users' needs and intent. There are mainly two types of software:

- System Software
- Application Software

System Software: These are the software that directly interacts with the computer system. The primary examples are Operating systems [OS] and device drivers.

Application Software: These are also called as customized software which is developed for personal use or developed for customers to perform some specific tasks.

Example: Tally, Ms-office, ERP Software.

What is a Computer?

A computer is an electronic device that is capable of receiving information or data and performing a series of operations in accordance with a set of operations.

It is a machine capable of solving problems and manipulating data. It accepts and processes the data by doing some mathematical and logical operations and gives us the desired output.

Therefore, we may define a computer as an electronic device that transforms data into information.

Data can be anything like marks obtained by you in various subjects, it can also be the name, age, sex, weight, height, etc. of all the students in your class or income, savings, investments, etc. of a country.

Operations Performed by a Computer

1. Storage: The data and instructions are saved/ stored permanently in the storage unit. The **storage unit performs the following major functions:**

- All data and instructions, before and after processing, are stored here, and
- Intermediate results of processing are also stored here.

2. Processing: The task of performing operations like arithmetic and logical operations is called processing.

The **Central Processing Unit (CPU)** takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. After this data is sent back to the storage unit.

3. Output: This is the process of producing results from the data for getting useful information. The output produced by the computer after processing is stored inside the computer before it is given to you in human-readable form. The output is also stored inside the computer for further processing.

4. Control: Controlling of all operations like input, processing and output are performed by a control unit. It takes care of the step-by-step processing of all operations inside the computer.

5. Computer System: In order to carry out its operations, a computer system is divided into three separate units. They are:

- Arithmetic logical unit,
- Control unit, and
- Central processing unit. All these three units are known as functional units.

6. Arithmetic Logical Unit (ALU): The processing of the data and instructions are performed by Arithmetic Logical Unit. The major operations performed by the ALU are addition, subtraction, multiplication, division, logic, and comparison. For processing, data is transferred from the storage unit to ALU. After processing, the output is returned back to the storage unit for further processing or for storing purposes.

7. Control Unit (CU): The next component of the computer is the Control Unit, which acts like the supervisor seeing that things are done in a proper way. The control unit determines the sequence in which computer programs and instructions are to be executed.

Activities like processing of programs stored in the main memory, interpretation of the instructions and issuing of signals for other units of the computer to execute them are carried out by CU.

It coordinates the activities of the computer's peripheral equipment which include input and output devices. The CPU (Central Processing Unit) is the device that interprets and executes instructions. A computer system includes a computer, peripheral devices, and software.

Characteristics of Computer

1. Speed: As you know computers can work very fast. It takes only a fraction of a second for calculations that manually take hours to complete. It takes a few minutes for the computer to process a huge amount of data and give the result.

2. Accuracy: The degree of accuracy of a computer is very high and every calculation is performed with the same accuracy. The accuracy level is determined on the basis of the design of the computer. The errors in computers are mainly due to humans and inaccurate data.

3. Diligence: A computer is free from tiredness, lack of concentration, fatigue, etc. It can work for hours without any error.

4. Versatility: The computer is highly versatile.

Generation of Computers

The history of computer development is in reference to different generations of computing devices. The first generation of computers appeared in mid-1940s.

The present-day computer, however, has undergone rapid changes over the last seven decades. This period, during which the evolution of the computer took place, can be divided into

- First 1946-59 Based on vacuum tube technology
- Second, 1957-64 Transistor-based technology replaces vacuum tube
- Third 1965-70 Integrated circuit (IC) technology developed
- Fourth 1970-90 Microprocessors developed
- Fifth 1990-till date Use of Bio-Chip technology

Types of Computers

Present-day computers can be categorized as below:

a) Supercomputers: These are the fastest computers and are very expensive. These are employed for specialized applications that require immense amounts of mathematical calculations. For example, weather forecasting requires a supercomputer. Other uses of supercomputers include animated graphics, fluid dynamic calculations, nuclear energy research, and petroleum exploration.

b) Mainframe Computer: It is a very large and expensive computer and is capable of supporting hundreds, or even thousands of users simultaneously. In the hierarchy that starts with a simple microprocessor (in watches, for example) at the bottom and moves to

supercomputers at the top, mainframes are just below supercomputers. In some ways, mainframes are more powerful than supercomputers because they support simultaneous programs. But supercomputers can execute a single program faster than a mainframe. The chief difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a few programs as fast as possible, whereas a mainframe uses its power to execute many programs concurrently.

c) Minicomputer: It is a mid-sized computer in size and power. It lies between workstations and mainframes. In the past decade, the distinction between large minicomputers and small mainframes has blurred. In general, a minicomputer is a multiprocessing system capable of supporting from 4 to about 200 users simultaneously.

d) Micro Computer Desktop Computer: It is a personal or micro-minicomputer sufficient to fit on a desk

- **Laptop Computer:** It is a portable computer complete with an integrated screen and keyboard. It is generally smaller in size than a desktop computer and larger than a notebook computer.
- **Palmtop Computer/Digital Diary /Notebook /PDAs (Personal Digital Assistant):** It is a hand-sized computer, Palmtop, does not have a keyboard, but its screen serves both as an input and output device.
- **Workstations:** It is a terminal or desktop computer in a network. In this context, a workstation is just a generic term for a user's machine (client machine) in contrast to a "server" or "mainframe".

Hardware and Software

Hardware refers to the physical equipment used for the input, processing, output, and storage activities of a computer system.

It consists of mechanical and electronic devices, which we are able to see and touch easily.

Some of them are **central processing units (CPU)**, **primary storage devices**, **secondary storage devices**, **input and output units** and **communication devices**.

These are explained below:

- **Central Processing Unit (CPU):** It manipulates the data and controls the tasks performed by the other components.
- **Primary Storage:** It stores temporary data and program instructions during the processing.
- **Primary Memory (main memory):** These are RAM (Random Access Memory/Read-Write Memory), and ROM (Read-only-memory).

- **Secondary Storage:** These store data and programs for future use. These are Hard Disk (Local Disk) and External Hard Disc, Optical Disks, (CDR, CDRW, DVD-R, DVD-RW), Pen Drive, Memory Cards, etc.
- **Secondary Storage Devices Communication Devices:** These are used for communication or flow of data from one computer to another computer. Some of them are Modem, Switch, Router, TV tuner cards, etc.

A computer cannot do anything on its own. It has to be guided by the user. We have to give a sequence of instructions to the computer in order to do any specific job.

Software is simply a computer program or a set of instructions. Software guides the computer at every step indicating where to start and stop during a particular job. The process of software development is called programming.

Types of Software

There are two types of software, namely,

- **System Software** and
- **Application Software**

System software is a general-purpose program designed to perform tasks such as controlling all operations required to move data into and out of the computer.

It communicates with keyboard, printer, card reader, disk, tapes, etc. It also monitors the use of various hardware like memory, CPU, etc. System software acts as an interface between hardware and application software. Some of the system software are Disc Operating System (DOS), Windows, Unix/Linux, MAC/OS X etc.

Application software is a set of programs, which are written to perform specific tasks of the users of the computer.

These software are developed in high-level languages to help the user to get the computer to perform various tasks. Some of the application software are MS Office, Macromedia (Dreamweaver, Flash, Freehand), Adobe (PageMaker, PhotoShop), LIBSYS, SOUL, WINISIS, KOHA, etc.

Input & Output Unit

An input and output unit consists of two parts namely, input devices and output devices. Normally, an input and output unit can control one or more peripheral devices.

Input Unit: The data is entered / input into the computer through input devices. The input devices translate the data/information from a natural language in which the user is working, into the machine language that the computer can understand.

Computer language is in the form of binary code (0 and 1).

Input devices are classified as follows:

- Human data entry devices - Keyboard, mouse, joystick, trackball, digitizing labels and pick devices - light pen touch screens.
- Source data entry devices (Audio input –speech recognition; video input - digital camera; scanners - optical scanner OCR, OMR, MICR, Barcode Reader).

Output Unit: The output unit accepts output data from the computer via output devices and transforms the data into human-readable form. All the information inside the computer is in the form of binary digits (0 and 1).

Output devices convert them to numbers, words, graphics, sound, and motion which we can easily understand. Output devices are classified as:

- Hard copy device (Printer, Plotter, Computer Output on Microfilm)
- Soft copy devices (Monitor, Visual Display Terminal, Video Output and Audio Response).

Operating System

An **Operating System** is a **system software** that acts as an interface between a user and the hardware of a computer.

Modern operating systems usually feature a graphical user interface which **uses a pointing device such as a mouse or keyboard for input**.

Operating Systems are viewed as resource managers **that manage the resources of a computer**.

The main resource is the computer hardware, which is **in the form of processors, storage, input/output devices, communication devices, and data**.

A good operating system should be efficient, reliable, **take short time in execution of programs, and occupy small memory as small as possible**.

The Main Operating Systems are:

1. Network Operating System – **WINDOWS 2000 – Unix – Linux**
2. Desktop Operating System – **WINDOWS – DOS (Disc Operating System) – Mac OS**
3. Mobile Operating System – **Palm OS – Pocket PC**

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