

Operating Systems

Definition and Resources under operating systems control

Definition

An operating system is a program that controls the execution of user applications and enables the user to access the hardware and software resources of the computer. Examples of operating systems are Windows, Linux, MsDOS, Android and IOS among others.

Resources under operating systems control

a) The processor - The operating system arranges the tasks according to priority and has the ability to stop a particular task to allow the processor to service another one.

b) Main memory (RAM) - The operating system determines which task will remain in memory awaiting for execution and which one will be sent back to secondary storage to wait.

c) Input and output devices and ports - The operating system controls all data input and information output tasks.

d) Secondary storage devices - The operating system manages the storage and retrieval of data on secondary storage devices.

e) Communication devices and ports - The operating system controls the overall communication process between various tasks and computers.

Functions of an operating system

a) Job scheduling - The OS determines which task will be processed first.

b) Resource control and allocation - The OS determines which task uses a particular resource and at what time. This prevents competition for resources.

c) Input and output handling - The OS coordinates between the various I/O and other peripheral devices such as auxiliary storage devices.

d) Memory management - OS organise the main memory into blocks and assigns storage partitions to data and instructions.

e) Error handling - OS monitors the status of the computer system by performing error checks on both hardware and the software. It thus alerts the user through error messages.

f) Job sequencing - OS arranges list of jobs or tasks currently being run in a particular order to make it easy for the processor to execute them and to know how and when to fetch instructions and data for each task.

g) Interrupt handling - OS manages any disruption that may cause the processor to stop executing the current task. It then returns the control back to the program that was interrupted using an Interrupt request number meaning a unique number assigned for each resource.

h) Communication - OS acts as an interface between the user, application programs and the hardware.

i) Security and access control - OS provides access controls to data and hardware by use of passwords as well as user access privileges. **Note:** The OS consists of the:

- **Kernel** - The part of an OS that provides interaction between application software and hardware resources of a computer.
- **Shell** - The user interface of an OS used to issue commands.

Classification of operating systems and Factors to consider when choosing an operating system

Operating systems are classified based on:

- Number of tasks it can run at the same time.
- Number of users it can support at the same time.
- User interface.

a) Classification according to the number of tasks it can run at the same time

i) *Single tasking operating system* - This type of OS only allows the user to run one interactive program at a time.

ii) *Multi-tasking operating system* - It allows one user to run several tasks apparently at the same time using one processor.

b) Classification according to number of users it can support at the same time

i) *Single user operating system* - This OS allows only one user at a time to run application(s). For example Ms DOS.

ii) *Multi user operating system* - This OS supports more than one user. Therefore one computer can be used by many users at the same time. For example, UNIX.

c) Classification according to user interface

i) *Command-line interface* - The user interacts by invoking commands through typing at the prompt, for example, MS DOS.

ii) *Menu-driven interface* - It provides the user with a list of options to choose from, for example, Ms DOS Editor.

iii) *Graphical User Interface (GUI)* - A userfriendly operating system that allows the user to interact with the computer through Windows, Icons, Menus, and Pointers (WIMP). Examples include Microsoft Windows 7 and Linux.

Factors to consider when choosing an operating system

- Hardware configuration or provision of the computer.
- User-friendliness
- Availability in the market.
- Reliability
- Cost
- Security features.
- Nature of applications the user intends to run

How an operating system organises information in a computer and manages files and folders

An operating system organises information using files, folders and storage media.

a) Files - is a collection of related data or information stored in one location and given a unique name that enables the OS to identify it during storage and retrieval process. There are three types of files:

i) **System files**- contains information that is critical for the operation of the computer. They have extensions like .sys, .ini and .dll. An example of a system file is system.ini.

ii) **Application files**-They are program files that contain programs or application files. They may have extensions such as .exe.

iii) **Data files**-used to store data and organise information.

b) Folders (directory) is a named storage area where the user can store related files to enable easy access.

c) Storage media provides the storage location for files or the folders created

How an operating system manages files and folders

- **Creating files or folders**-The process of using a specific application program to come up with a work area, assign it a unique name, specify its storage location and eventually save it.
- **Saving files**-The process of storing a file in a storage media or in a folder.
- **Renaming files or folders**-The process of giving a file or a folder a different name from the one it had been saved with on the storage media.
- **Deleting files and folders** -The process of removing a file or a folder from the storage media.
- **Copying and moving files and folders**-The process of creating exact replica of an existing file or a folder in the storage media.
- **Sorting files and folder**-The process of arranging files or folders in a following a specified criterion.
- **Searching for files and folders**-The process of looking for files in the storage media when you are not able to remember its exact storage location

Disk management using windows

- **Formatting disk**: It is the process of preparing a disk for use by creating tracks and sectors on the surface to allow storage of data.
- **Disk scanning for errors**: Checks up and repairs minor storage problems, such as lost storage locations, or damaged surface.
- **Disk scanning for viruses**: Checking the disk whether it is infected with destructive and malicious programs and possibly cleaning the media.
- **Disk defragmentation**: Rearranging scattered parts of a file on a storage media to a contiguous location, in order to speed up access to the files.
- **Disk compressing**: Squeezing storage media contents to fit in smaller space so as to create more space on the media.
- **Backing up data**: Creating a duplicate of files on separate storage device to avoid losing important data and program files in case the storage device or the computer fails.
- **Partitioning a disk**: Dividing a large physical disk into two or more logical drives. It enables the computer user to install more than one operating system and also easy data back up

Sample KCSE Questions

1.A computer C directory has folders for Form 1, Form 2, Form 3 and Form 4. Each class has student's folders labeled according to their admission number. The students create their own folder for the subject they are studying based on the table shown below

Form 1	Form 2	Form 3	Form 4
OS	SP	Prog.	ADB
WP	DTP DB	Internet	

Other than I/O devices, list other three devices under the control of the operating system. (3 marks)

2.A multinational organisation has offered to donate computers to your school. The Board of Governors has requested you to advise on the operating systems to be used by providing answers to the following questions:

a) What is an operating system? (1 mark)

3.Explain the following operating system functions.

a) Job scheduling (1 mark)

b) Interrupt handling (1 mark)

4.State two tasks performed by the operating system in each of the following resources:

i) Memory

ii) Input and output devices (2 marks)

5.One of the functions of an operating system is job scheduling. Explain what is meant by job scheduling. (1 mark)

6.A multinational organisation has offered to donate computers to your school. The Board of Governors has requested you to advise on the operating systems to be used by providing answers to the following questions:

i) Briefly explain any four functions of an operating system. (8 marks)

7.Distinguish between the terms single-tasking and multi-user as used in operating systems. (2 marks)

8.Name two multiprogramming operating systems. (2 marks)

9.Differentiate between single- user and multi - user operating systems giving an example of each. (3 marks)

10.List and explain three types of user interfaces. (6 marks)

11.State two differences between Disk operating system (DOS) and Windows operating system. (2 marks)

12.List four factors to be considered when purchasing an operating system. (4 marks)

13.State any four criteria for choosing an operating system. (4 marks)

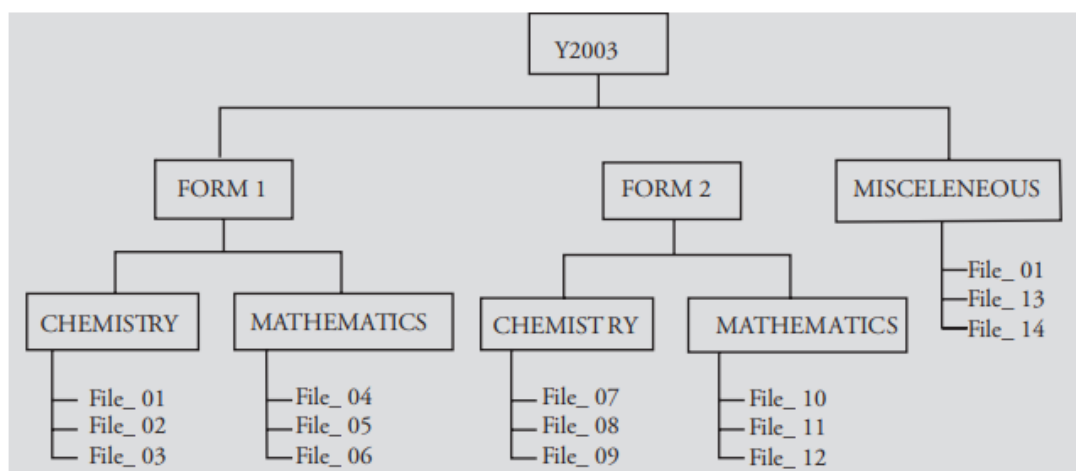
14.Mary was advised to partition a hard disk for her computer. Explain two reasons that may have necessitated this. (4 marks)

15.Explain the importance of disk partitioning. (2 marks)

16.A secretary saved a document in a computer. After some time, she could not remember the name and the location of the file. State four details that are assigned a file by the operating system, which can assist in tracing the file. KCSE 2013 (2 marks)

17.Distinguish between formatting a disk and scanning a disk with reference to operating systems. (2 marks)

18. An operating system organises files in directories as shown in the chart below. Study it and answer the questions that follow.



- a) i) What is the name of this file structure? (1 mark)
- ii) One of the files in MISCELENEOUS has a file name similar to one in CHEMISTRY in form 1. Describe what happens if all the contents of CHEMISTRY are copied to MISCELLANEOUS. (2 marks)
- iii) What will happen if an attempt is made to delete FORM2 while File_10 in MATHEMATICS is open? (1 mark)
- iv) State four advantages of this structure. (2 marks)
- b) State four properties that an operating system displays about a file. (2 marks)
- c) A removable storage media unit connected to a single user microprocessor system is used for permanent storage of programs and data. State six file functions you would expect the operating system of the computer to provide to enable the user to maintain this storage media. (3 marks)
- d) State two tasks performed by the operating system in each of the following resources:
 - i) Memory
 - ii) Input and output devices (2 marks)