

Chapter 1

OPERATING SYSTEM

Scope of the Syllabus

Probable marks : 22

- What is an Operating System ?
- Services in O.S.
- Overview of Windows 98, Windows NT and LINUX
- Concepts related to Information Management (only definition) :
- File systems, Device drivers and Terminal I/O
- Concepts related to Process Management (only definition) :
- Process, concepts of multiprogramming, context switching, process states, priority, multitasking.
- Concepts related to memory management (only definition) :
- Memory map of single user computer system, partitions, fixed and variable partitions, paging, segmentation and virtual memory.
- G.U.I. (Basic of G.U.I.) :
- GUI features such as windows, task list, drag, resize, minimize, maximize, close.
- Access and security aspects of O.S. :
- Security threats, attacks on security, computer worms, computer viruses

OPERATING SYSTEM

Q.1 What is an Operating System ? Write its function.

(Oct. 2004, 2007 Mar. 2009, July 2019, March 2020, Dec. 2020)

Ans. : An Operating System is a program, which acts as an interface between the user of computer and the computer hardware.

The operating system can be viewed as a set of software programs, normally supplied along with hardware for the effective and easy use of the machine.

The main functions of an operating system are :

- i) The primary aim of the operating system is to make the hardware convenient to use.
- ii) To help users to execute programs.
- iii) To control execution of program to prevent errors and improper use of computer system.
- iv) To make provision for security of information to users.
- v) To eliminate duplicate errors by number of programmers in development of complicated routines.
- vi) It provides facility to share the same hardware among the users.
- vii) Proper scheduling of resources among users.

SERVICES IN O.S.

Q.2 Which are the three main areas in which the operating system divides its services? Give examples.

(March 2002, 06, 08, 09, 13, Oct. 2004, 07, 14, 15; March 2020, 22, Dec. 2020)

Ans. : The O.S. divides its services in the following three main areas :

i) Information Management (IM)

ii) Process Management (PM)

iii) Memory Management (MM)

i) IM : Information Management provides facilities to store, retrieve, modify the information on various devices. The services provided under IM are :

- create files or directories.
- open files or explore directories.
- delete, copy or close files.
- change working directory.

ii) PM : The services provided under process management are directed to keep track of all running programs, called processes. In multiuser operating systems, number of users located at different terminals may execute different programs at a time. In such case operating system keeps track of all processes. It schedules them and dispatches them one after another.

iii) MM : The services in Memory Management keep track of all memory locations. They determine memory allocation policy and use various techniques and algorithms to achieve this.

Q.3 What is Information Management? List the system calls in it.

(Oct. 2012)

Ans. : 1) Information Management provides the facility to store, retrieve, modify or remove the information on files/directories. 2) These system services manage the organization of information into files and directories by allocating memory space to them. 3) It also ensures that correct programs have access to information, have occupied memory space and driving various devices. 4) Some of the system services (system calls) provided under IM are :

i) Create a file.

iii) Open a file for read/write purposes.

v) Close a file.

vii) Write data from buffer to file.

ix) Create a link.

ii) Create a directory.

iv) Explore a directory.

vi) Read data from file to buffer.

viii) Move file pointer.

x) Change working directory.

Q.4 What is Process Management? List the system calls in Process Management.

(Oct. 2005)

Ans. :

1) In multiuser operating system, a number of users, located at different terminals of a network, may execute same or different programs at a time.

- 2) But such a computer system has only one C.P.U. and it can execute only one instruction, belonging to any one of these programs at the same time.
- 3) The Process Management of such O. S. keeps track of all running programs called processes, Schedule them and dispatch them one after the other. While doing so, it gives an impression to each user that it has the full control of C.P.U.
- 4) The Process Management modules of single user O.S. are less complicated than multiuser O.S.
- 5) The services provided under Process Management are (system calls) :

i) Read a process.	ii) Block a process.
iii) Resume a process.	iv) Terminate a process.
v) Suspend a process.	vi) Delay a process.
vii) Change the priority of a process	viii) Generate a process.

Q. 5 What is Memory Management ? What are the services provided under it ?

Ans. :

- 1) When a job is to be executed, the O.S. loads the job in main memory from disk.
- 2) But before loading it in memory, it should know that how much of free memory is available and how much of memory should be allocated to the job.
- 3) For this, the operating system keeps list of all free memory location. Before a program is loaded in memory the operating system consults with this list. It loads the program into memory and modifies the list.
- 4) When the program is executed complete, it removes programs from main memory and again modify the list.
- 5) For this, the O.S. determines memory allocation/deallocation policies and uses various techniques and algorithms to achieve this.
- 6) The system calls in it are :
 - i) To allocate a chunk of memory to a process.
 - ii) To free chunk of memory from a process.

Q. 6 What is system Call ? List any two system calls for memory management, Process management and information management. (March 2015, July 2017)

Ans. :

- System Call - System calls provides the interface between a process and the operating system. These calls are generally available as n assembly language instruction.
1. System calls in Memory Management - a. To allocate a chunk of memory to a process To free chunk of memory from a process
 2. System calls in Process Management - a. Read a process b. Block a process c. Resume a process d. Suspend a process e. Delay a process
 3. System calls in Information Management - a. Create a file b. Create a directory c. Open a file d. Close a file e. Create a link f. Move file pointer

Q. 7 What is meant by a system call ? How it is used ? How does an application program (AP) use these calls during execution ? (Oct. 2003, Mar. 2006)

Ans. :

- 1) System call : System call provides the interface between a process and the operating system. These calls are generally available as assembly language instructions.
- 2) System calls are used in different ways as :
 - (a) Some system may allow system calls to be made directly from a higher level language program. In this, calls are predefined function or subroutine.
 - (b) Some languages – C, PERL – allow system calls to be made directly.
 - (c) FORTRAN system provides set of library routines.
- 3) An application program uses sequence of system calls during execution. To prompt a message on the terminal AP uses system call. Next, read from the terminal AP uses another system call. Similarly for each and every task, program uses various system calls.

OVERVIEW OF OPERATING SYSTEM

Q. 8 What are the features of Windows 98 ? (Oct.2004, 13, March 2015, 2020, July 17)

Ans. : The main features of Windows 98 are as listed below :

- i) Easier to use :
 - 1) Windows 98 is a single user multitasking operating system.
 - 2) Navigating around the computer is easier in Windows 98.
 - 3) A file can be opened by a single click.
 - 4) Windows 98 allows us to use multiple monitors with single computer.
 - 5) New hardware can be easily installed and used without restarting computer.
 - 6) With Windows 98 we can use digital cameras and other digital imaging devices.
- ii) Faster :
 - 1) Windows and programs open faster than in Windows 95.
 - 2) The computer speed and efficiency can be easily improved by simple maintenance.
- iii) True web integration :
 - 1) Windows 98 can be easily connected to internet.
 - 2) Web pages can be viewed in any window.
 - 3) Using Microsoft Outlook Express, E-mails and message can be send to internet newsgroups.
 - 4) The internet conferences can also be arranged.
- iv) More entertaining :
 - 1) Windows 98 supports DVD and digital audio. User can play high quality digital movies and audio on the computer.
 - 2) The television broadcast can also be seen.

Q. 9 What are the features of Windows NT? OR

(Mar.2011, 2016, 2017)

Explain any four features of Windows NT operating system.

(Oct.2002, 2006, 2012, 2013, July 2017)

Ans. : The features of Windows NT are as listed below :

- i) Windows NT is multitasking, multiuser and multithreading operating system.
- ii) A user will get faster response even though multiple applications are running.
- iii) Windows NT supports virtual memory management system to allow multiprogramming.
- iv) Symmetric multiprocessing in windows NT allows it to schedule various tasks on any C.P.U. in a multiprocessor system.
- v) Windows NT is a 32-bit operating system.
- vi) Windows NT uses New Technology File Systems (NTFS), which implements fault tolerance, security and has support for very large files.

Q. 10 What are the features of Linux ? (March 2004, 2014, 2019, July 2017, 2018, Dec. 2020)

Ans. : Some of the features of Linux are as given below :

(Oct 2013, 2014)

- i) Linux is a multiuser, operating system with a full set of unix compatible tools.
- ii) Linux runs on a wide variety of platforms. It was developed exclusively on PC architecture.
- iii) It provides as much as functionality from limited resources. It can run on machine having 4MB of RAM.
- iv) Linux presents standard interfaces to both the programmer and user.
- v) Linux supports a wide base of applications.
- vi) Linux is free software. Free in the sense that people can copy it, modify it, use it in any manner they want.
- vii) The file system in LINUX obeys UNIX semantics.

Q. 11 What are the components of Linux system ?

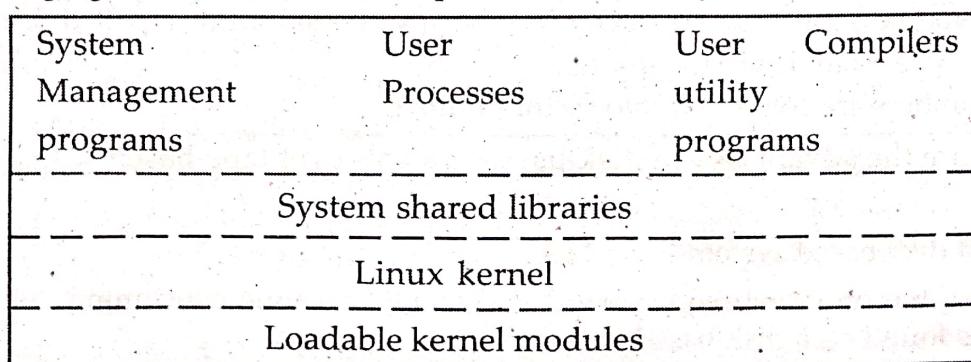
(March 2004)

Ans. :

The Linux is composed of three main bodies :

1. Kernel : Kernel maintains all important abstractions of the operating system, such as processes and virtual memory.
2. System libraries : System libraries define a standard set of functions through which applications can interact with the kernel, and which implements much of the O.S. functionality.
3. System utilities : These are programs that perform individual, specialised management tasks. Some system utilities may be invoked just once to initialize and configure some aspects of system.

Following figure shows various components of Linux system :



CONCEPTS RELATED TO INFORMATION MANAGEMENT**Q. 12 What is a file system ?****(March 2015, 2018; July 2018)****Ans. :**

- 1) The collection of related information i.e. data or programs is called as file.
- 2) Each file has a specific name, which is used to refer that file.
- 3) For convenient use of the computer system, the O.S. provides a uniform logical view of information storage.
- 4) The operating system manages mass storage devices to implement the abstract concept of file.
- 5) The O.S. maps files on to physical devices such as tapes or disks.
- 6) Using various data structures, file system in IM allows user to define files and directories and allocate/deallocate the disk space to each file.
- 7) There are two types of file systems :
 - i) Tape - based systems ii) Disk - based systems.
- i) **Tape-based systems :**
 - (a) Tape-based systems are simple but inefficient.
 - (b) In these systems, files are stored on to reels of physical tapes. Generally one or more files are stored on to one tape.
 - (c) Tapes are used for transport of data from one computer to another.
- ii) **Disk - based systems :**
 - (a) Each disk is divided into tracks and each track is further divided into number of sectors.
 - (b) Number of tracks and size of sectors is variable. It varies from one drive to another.
 - (c) A disk has a device directory, indicating, which files are on the disk. The directory lists the file name, starting address, file length, type of file, time of creation, and time of last update etc.

Q. 13 What are the functions of file system and device management system?**Ans.:** Functions of file system are:

1. It allows the user to define files and directories and allocated/deallocate the disk space to each file.
2. It stores data or information.
3. Arrange various file of same type under one directory.
4. Open a file; create a file, delete a directory and set certain access controls on a file.

Function of device management or device driver are :

1. Written special subroutine for each I/O device such subroutine is called device driver.
2. It moves data from driver to terminal.
3. Block numbers are converted into sector number.

Q. 14 What are the advantages of disk-based systems over tape-based systems ?**Ans. :****Advantages of disk-based systems over tape - based systems are :**

- i) Finding a file on tape-based systems is difficult and time consuming, while a file can easily be found on a disk-based system.

- ii) In tape-based systems, if a file is to be modified, it requires to copy entire tape whereas in a disk based systems a file can be modified easily, without copying the entire disk.
- iii) Store large information in disk-based systems as compared to tape-based systems.
- iv) Disk-based systems are easier and convenient to use instead of tape-based systems.
- v) Each disk consists of number of blocks, which can be rewritten easily, while we require entire tape to copy, if we have to rewrite something.

Q. 15 Explain three stages of I/O operations related to disk?

OR Explain why user is not allowed to directly interact with the hard disk. [March 16]

Ans.:

I/O operations required to read data from disk. These operations are as follows :

To move R/W heads from the current address to the target address three stages are :

1. The time taken to move R/W head in or out to position on the correct track is called seek time.
2. The time taken to wait until the desired sector comes under R/W head as the disk rotates is called latency or rotational delay.
3. The time taken to activate R/W head for appropriate surface and read data is known as transmission data.

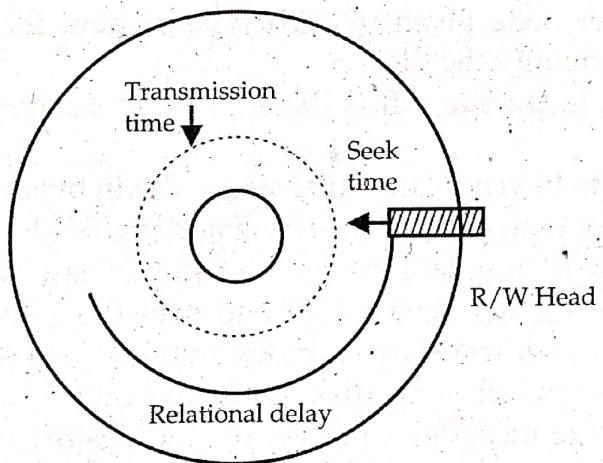


Fig. Q. 15

Q. 16 Explain the file system related to Information Management with file operations only. [March 2004, 2007; Oct. 2015]

Ans. :

- 1) The file system related to IM allows the user to define files and directories and allocate/deallocate the disk space to each file.
- 2) A file is a collection of related information. It can be program or data.
- 3) File operations : The file concept is implemented by the operating system. System calls are provided to create, read, write, rewind and delete files.
 - (a) Create a file : For creating a file, first whether sufficient space is available for that file is checked. If it is available, entry for new file must be made in directory.
 - (b) Write to a file : For writing to a file, there is command in which name of the file is given. Then operating system search for that file in directory entry and write to it.

- (c) Reading a file : For reading a file, there is a system call in which file name is specified. Then operating system searches for that file in directory entry and read it.
- (d) Rewind a file : The directory is searched for appropriate entry and file is reset to the beginning of file.
- (e) Delete a file : To delete a file, directory entry is searched and if file is found, it releases the memory space and that directory entry now become invalid.

Q. 17 Define a block with reference to Operating System. What are the parameters of a block of data that are concerned with an Operating System. Explain in brief.
(March 2012)

Ans.: Definition of block :

A block is a logical unit of data that operating system defines for its convenience. Thus block is a contiguous set of bits or bytes that forms an identifiable unit of data.

Operating system has following parameters of a block

1. File ID
 2. The starting position in the file
 3. The number of bytes to be read
 4. The starting address of memory Where data. is to be read.
1. File ID – It is a letter code given to each type of data file to make it easier for the operating system to identify the files.
 2. The starting position in the file – It is the address of memory location from where file will start.
 3. The number of bytes to be read – It is total size of file in bytes.
 4. The starting address of memory – It is starting address of block.

Whenever program read any data the file system translates request into reading one or more sector from disk and instruct device driver to read these sector O.S. keeps all its data structure in terms of block O.S. translates a block number into sector number. File system request to read desired blocks. It uses disk space allocation i.e. linked list to carry out translation. File system then request device driver to read desired block. DD issues instruction to the controller for the disk to read required blocks. Controller reads data sector by sector and stores it in its own memory until desired block are read in.

Q. 18 Define a Block of data. State necessary parameters to be provided to O.S. to access a block of data.
(March 2014)

Ans.: A block is a physical unit of data on the disk. Block consist of one or more contiguous sector. Parameters to be provided to O.S. to access block of data

1. Sector Number (SN) -Entire disk view as a series of sector from 0 to n as sector number.
2. Relative Byte Number (RBN) -O.S. calculate RBN for each record. This is starting byte no. of each record.
3. Relative Record Number (RRN) -O.S maintains a field called Cursor to keep track of current RRN which is incremented after each record is read / written.
4. Physical Block Number (PBN) -O.S. translate logical block number into Physical Block Number.
5. Physical Sector Address -While reading a record, if the physical address is maintained in the index, DMS itself can access the final address without going to go through various level of address translation.

6. Logical Block Number (LBN) -File system of OS calculate the Logical Block Number as integer value of RBN /512.
7. Logical Address -File System of OS translate logical address into Physical address.
8. FAT (File Allocation Table) -Before any file is written or read, OS brings the blocks containing FAT entries in memory for future operation.

Q. 19 Explain the following terms in case of magnetic disk :

- (i) Tracks and Sectors (ii) Seek time
- (iii) Transmission time (iv) Latency time/ Rotational delay

(Mar. 2006, 2009 Oct. 2003, 2006, 2021, July 2017)

Ans. :

- i) Tracks and Sectors :Magnetic disk surface is made up of concentric circles called tracks. The number of tracks varies depending on the disk type. A track is further divided into smaller areas called sectors.
A sector is a smallest unit of information which can be read from or written to the disk. Sector varies from 32 bytes to 4096 bytes and track contains 4 to 32 sectors per track and from 75 to 500 tracks per disk surface.
- ii) Seek time :The time required for read/write heads to move to the correct track is called as seek time.
- iii) Transmission time :The time required for activate Read/Write head for appropriate surface and read data is called as transmission time.
- iv) Latency time/Rotational delay :The time required for requested sector on track to rotate below the head is called as latency time or rotational delay.

Q. 20 Explain internal and external fragmentation.

(March 2020, Dec. 2020, Oct. 2021)

Ans. : Internal fragmentation :

Wastage of memory space within partition is called as internal fragmentation. A file consists of number of blocks. Consider the block size of a O. S is 1024 bytes and a file is of 3499 bytes.

Then, when it is loaded in memory for execution it would have allocated 4 blocks. Thus last 597 bytes would be wasted. This is called as internal fragmentation.

Larger block size causes more internal fragmentation.

External fragmentation :

Variable partition suffers from external fragmentation.

Suppose a job of 512 bytes is terminated and new job is of 256 bytes is loaded in the partition, then 256 bytes of memory is wasted. This is called as external fragmentation.

Q. 21 What are device drivers?

(March 2010; July 2018)

- Ans. : 1) Device drivers are software programs required for each device.
- 2) Each device will require different drivers as per functionality.
- 3) A device driver knows how the buffers, flags, register control and status bits should be used for a particular device.
- 4) Some device drivers are useful for data conversion.

- 5) For simply reading a character from a device involves complex sequence of device specification operations.
- 6) Rather than writing the code every time, the device driver was simply used from library.

Q. 22 What is VDU ? Explain the following terms :

- a) Dumb terminal b) Intelligent terminal

(March 2002, Oct. 2007, March 2018; July 2018)

Ans. :

- 1) A visual display unit (VDU) or terminal is nothing but a common I/O medium.
 - 2) There are generally two parts of terminal I/O hardware :
 - i) Input unit e.g. keyboard
 - ii) Output unit e.g. screen
 - 3) There are two types of terminals :
 - i) Dumb terminal
 - ii) Intelligent terminal.
- i) Dumb terminal :
- (a) A dumb terminal consists of a microprocessor on which small programs can run and limited amount of memory.
 - (b) It is responsible for basic I/O operations.
 - (c) A dumb terminal does no processing on input characters.
- ii) Intelligent terminal :
- (a) An intelligent terminal has powerful hardware and software than a dumb terminal.
 - (b) It also has more amount of memory.
 - (c) It can carry out some process on input characters also it can process programs independently.

Q. 23 Explain the use of video RAM. Explain data bytes and attribute bytes.

(Mar. 03, 08, 11, 13; Oct. 13, 21, July 16)

Ans. :

- i) The video RAM is basically the memory that the terminal hardware itself has.
- ii) Anytime all characters stored in the video RAM are displayed on the screen by the video controller using display electronics.
- iii) All particular informations (attributes) are stored in video RAM.
- iv) Video RAM consists of 2000 databytes (0 to 1999) preceded by 2000 corresponding attribute bytes (0 to 1999) as shown in figure.

Attribute Byte 0	Data Byte 0	Attribute Byte 1	Data Byte 1	Attribute Byte 1999	Data Byte 1999

- v) A typical alphanumeric screen can display 25 lines each consisting of 80 characters i.e. $25 \times 80 = 2000$ characters.
- vi) Data Byte : All 2000 characters are stored in video RAM. To display any specific character on the screen at a specific position all ASCII or EBCDIC code for that character is to move in video RAM.
- vii) Attribute Byte : There is one attribute byte for each data byte. This byte tells the video controller how the character is to be displayed. It signifies whether the corresponding data character which is stored next to it in the video RAM is to be displayed bold, underlined, blinking or in reverse video etc.

Q. 24 Explain in brief : (ii) Types of Memory Mapped I/O Terminals. (March 2010)

Ans. :

Types of Memory Mapped I/O Terminals:

Two types of Memory Mapped I/O Terminals;

- i) Alphanumeric (Character oriented) : Please refer ch1/Q-23/p-1.-10)
- ii) Graphics (Bit oriented) : 1) For bit oriented color graphics terminals require 24 or 32 for each byte or bit. 2) This increases Video RAM capacity requirement.

Q. 25 Why keyboard is referred as memory map terminal? Explain the multiple memory location involved in the input-output operations between the keyboard and screen. (March 2005, 2010, Oct.2010, July 2016)

Ans. :

- (a) Terminals have a video RAM generally with 2000 data bytes preceded by 2000 corresponding attribute bytes.
- (b) Anytime, all the 2000 characters ($25 \text{ lines} \times 80 \text{ columns}$ on screen) stored in video RAM are displayed on the screen by the video controller.
- (c) The video RAM is treated as part of the main memory only.
- (d) Therefore, for moving any data in or out of the video RAM, ordinary load or store instructions are sufficient.
- (e) So, keyboard is referred as memory map terminal.

The following multiple memory locations are involved in the input-output operations between the keyboard and screen :

- (a) Small memory within the keyboard itself : When a character is keyed in, the 8-bit ASCII EBCDIC code is generated which is stored temporarily in the memory of the terminal itself.
- (b) The video-RAM (data and attribute byte) : The ASCII or EBCDIC code for the character is to move to the video RAM at the corresponding position with appropriate co-ordinates.
- (c) The operating system buffers : The operating system has one buffer for each terminal and two separate buffers for input and output operations.
- (d) The I/O area of the application program : When the user finishes keying in the data, the data stored in operating system buffer for that terminal is flushed out to the I/O area of the application program which wants that data.

CONCEPT RELATED TO PROCESS MANAGEMENT

Q. 26 What is a process ?

(Oct. 2002, Oct. 2004)

Ans. : Process :

- A process is defined as a program under execution, which competes for CPU time and other resources.
- In simple terms, a program does not compete for computing resources such as C.P.U. time or memory, whereas a process does. A program may be present on paper or reside on disk. It may be compiled or tested but it still does not compete for computing resources.
- Once a user wants to execute a program, it is located on the disk and loaded in the main memory, at that time, it becomes a process, because it then compete for C.P.U. time and other resources.

Q. 27 Define the terms : 1) Context switching 2) Degree of multiprogramming.

Ans. :

1) Context switching :

In multiprogramming system, multiple processes are run at the same time such that when process 1 wait for an I/O, process 2 executes and vice versa. The lost in time, in turning the attention of CPU from one process to another is called as context switching.

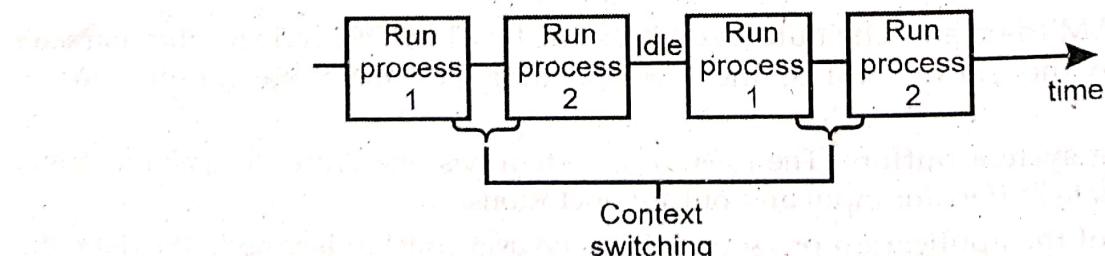
2) Degree of multiprogramming :

The number of processes running simultaneously and hence competing for CPU is known as degree of multiprogramming.

Q. 28 Explain context switching at a process level in multiprogramming system with example. **(March 2002, 09, 11, 16, 22; Oct. 2010, 15, July 2016)**

Ans. :

- Multiprogramming is the concept of increasing utilisation of C.P.U. by always having something for C.P.U. to execute.
- In multiprogramming, C.P.U. can execute two or more processes simultaneously. When process 1 waits for an external event such as an I/O operation, C.P.U. executes process 2 and vice versa.
- When C.P.U. switches from one process to another the time required for switching is called as context switching.



- Let A and B be the two processes ready for execution and requires C.P.U. time for execution.

Let CPU time be given to process A, which is having some instructions depending on process B or on some external event such as an I/O operation. Then, it is the job of operating system to halt the execution of process A and give C.P.U. time for process B. The loss in time in turning the attention of C.P.U. from process A to process B is known as context switching.

v) During context switching the status of C.P.U. registers and flags of the old process are stored in memory.

vi) For-e.g :- // A. CPP

```
# include <iostream.h>
# include "B.h"
void main ()
{
    int a = 10, b = 20;
    cout << add (a,b);
}
// B.h
# include <iostream.h>
int add (int x, int y)
{
    return (x+y);
}
```

Here A and B are the two processes, where process A is depending on B. When process A is being executed, CPU executes instructions one by one. When it comes to the instruction cout <<add(a,b); it stops execution because the output of this instruction depends on Output of process B.

Thus there is need of execution of process B. So C.P.U. stores the contents of registers and flags of process A in RSA (Register Save Area). It then loads process B in memory. The time required for this is known as context switch. The CPU then executes process B and output is given to process A and execution of process A restarts from the instruction from which it was halted.

Q. 29 Explain Running, Ready and Blocked process states in process management. OR Discuss various process states with examples.

(Oct. 2002, 04, 05, 12 Mar. 2012, 13, 14, March 2018; July 2019)

Ans. :

In order to manage switching between processes, the operating system defines three basic process states, which are as given below.

i) **Running state :**

There is only one process, which is executed by C.P.U. at any given moment. This process is called as running process. In multiprocessor systems, with multiple C.P.U.s, there are many running processes at a given moment. The operating system keeps track of all of them.

ii) Ready state :

The process, which is not waiting for an external event such as an I/O operation, but which is not running is said to be in ready state. Actually, a process in ready state could have been running. But the fact that, there is only one C.P.U., which is executing some other process, while this process is waiting for C.P.U.'s attention towards it.

iii) Blocked state :

When a process is waiting for an external event such as an I/O operation, the process is said to be in blocked state. The major difference between blocked and ready process is that a blocked process can not be directly scheduled even if CPU is free, whereas a ready process can be scheduled if the C.P.U. is free.

Q. 30 What is process scheduling ? Explain scheduling objectives.

(July 2019)

Ans. :

- 1) In a Multiuser Operating System, a number of programs are running simultaneously and these are called as processes.
- 2) In this case the O.S. has to keep track of all these processes and will have to dispatch them one after another. This is known as process scheduling.
- 3) While scheduling various processes, there are many objectives for the operating system. Some of these objectives conflict with each other. Therefore, the O.S. designers have to choose a set of objectives to be achieved. Some of these objectives are as listed below :

i) Fairness	ii) Good throughput
iii) Good CPU utilization	iv) Low turnaround time
v) Low waiting time	vi) Good response time.

 i) Fairness refers to being fair to every user in terms of C.P.U. time
 ii) Throughput refers to the total productive work done by all the users put together.
 iii) CPU utilization is the fraction of the time that the CPU is busy.
 iv) Turnaround time is the elapsed time between the time a program or job is submitted and the time when it is completed.
 v) Waiting time is the time a job spends waiting in the queue of the newly admitted processes for the operating system to allocate resources to it before commencing its execution.
 vi) Response time is the time slice for responding to a question or an event. It depends on degree of multiprogramming, the efficiency of the hardware along with the O.S. and the policy of O.S. to allocate the resources.

Q. 31 Explain the following terms in case of process scheduling :

(Mar. 2005)

(a) Turnaround time (b) Waiting time

(Oct. 2008, March 2018)

(b) Terminal response time (d) Event response time

(July 2019, Oct. 2021)

Ans. :

- (1) Turnaround time : Turnaround time is the elapsed time between the time a program or a job is submitted and the time when it is completed.
- (2) Waiting time : Waiting time is the time a job spends waiting in the queue of the newly admitted processes for the operating system to allocate resources to it before commencing its execution.

- (3) Terminal response time : In the Time-sharing system, Terminal response time is the time to respond with an answer or result to a question and it depends on degree of multiprogramming, the efficiency of hardware with OS and policy of OS to allocate resources.
- (4) Event response time : In the real-time system, event response time is the time to respond with an event.

Q. 32 What are preemptive and non-preemptive philosophies of scheduling.

Ans. : There are basically two scheduling philosophies, depending upon the need. The operating system designers has to select one of them.

Preemptive philosophy :

- i) This philosophy allows a higher priority process to replace a currently running process, even if its time slice is not over or it has not requested for any external operation.
- ii) This requires context switching more frequently.
- iii) It is suited for on-line, real time processing, where interactive users and high priority processes require immediate attention.
- iv) The preemptive philosophy increases fairness of the system but decreases throughput.

Non-preemptive philosophy :

- i) In a non-preemptive philosophy, a running process retains the control of the CPU and all the allocated resources, until it surrenders control to the operating system (on its own wish).
- ii) This means that even a high priority process enters the system, the running process can not be forced to give up control.
- iii) However if the running process is blocked due to some external request another process can be scheduled.
- iv) It is not suited for real time systems, where high priority events requires an immediate attention.
- v) Non-preemptive philosophy increases throughput of the system but decreases fairness.

Q. 33 What is mean by preemptive scheduling? How does it affect the system performance verses non-preemptive scheduling?

Ans.: Preemptive scheduling allows a higher priority process to replace a currently running process, even if its time slice is not over or it has not requested for any I/O. This requires context switching more frequently. It is used for on-line, real time processing.

At railways reservation system or a bank is concerned with bookings, cancellation and many types of enquiries response time is very crucial otherwise customer satisfaction will be poor. In such a case preemptive scheduling is better.

In case of non-preemptive scheduling running process cannot be forced to give up to control.

Q. 34 What is priority ? Explain internal and external priorities.

(Oct. 2007)

Ans. :

- 1) The concept of arranging ready processes in a queue so that they can be dispatched one after another for execution depending on some policy is known as priority.

- 2) Due to many processes competing for the same available resources like C.P.U. and memory, concept of priority is used.
- 3) A priority may be external (or global) or internal (or local).
- (a) External or global priority :
- (1) An external priority is specified by the user externally generally at the time of initiating the process.
- (2) In many cases, the operating system allows user to change its priority externally even during its execution.
- (3) If the user does not specify any external priority at all, the operating system assumes a certain priority, called the default priority. But when an urgent job needs to be done, the system manager permits the process to be created with a higher priority.
- (b) Internal priority or local priority :
- (1) The concept of internal priority is used by scheduling algorithms. They base their calculations on the current state of the process e.g. each user, while firing a process, can be forced to specify the expected time that the process is likely to take for completion.
- (2) The operating system can then set internal priority, which is highest for the shortest job (SJF i.e. shortest job first algorithm), so that at only a little extra cost to large job, many short jobs will complete.
- (3) This has two advantages : (a) If short jobs are finished faster, the number of processes competing for C.P.U. will be decreased. (b) The number of satisfied users will increase.
- (4) However if a stream of short jobs keeps coming on, an important large job may suffer from indefinite postponement. To avoid this, set higher external priority to important large jobs.

Q. 35 With reference to process management explain the terms:

- (i) External priority (ii) Purchased priority
(iii) Internal priority (iv) Time slice

(Mar. 2003, 06, 08, 11, 16, 17, 19, Dec. 2020)

Ans. :

(i) External Priority : Please refer Q. No. 34.

(ii) Purchase priority :

- (a) This priority is used in some data centre situations where each user pays for the time used.
- (b) Higher priority processes are charged at a higher rate to prevent each user from firing his job at the highest priority. This is known as scheme of purchased priority.
- (c) Operating system keeps track of the time used by each process and the priority at which it was used.

(iii) Internal priority : Please refer Q. No. 34.

(iv) Time slice :

- (a) Each process is normally given certain time to run irrespective of its importance. This is known as Time slice.
- (b) Time slice given to each process so that a process does not use the CPU indefinitely.

Q. 36 What is multitasking? Explain in brief.

Ans. :

- 1) A task can be defined as an asynchronous code path within a process.
- 2) Hence in operating systems which supports multitasking, a process can be considered to be made up of number of tasks, which can run simultaneously in the same way that a multiuser operating system supports multiple process at the same time.
- 3) Just like processes, a task can also have priorities and states.
- 4) A task can be in ready, running or blocked states and accordingly task control blocks (TCB) are linked together.
- 5) When the operating system schedules a process with multiple tasks and allocates time slice to it, the following happens :
 - (i) The operating system select the highest priority ready task within that process and schedules it.
 - (ii) At any time if the process time slice is over, the operating system turns the process as well as currently running task into ready state from running state.
 - (iii) If the process time slice is not over but the current task is either over or blocked, the operating system chooses next highest priority ready task within that process and schedules it.
 - (iv) If there is no other ready task within that process only then the O.S. turns that process to blocked state.

The multitasking operating system provides "Inter Task Communication" & "Task Synchronization" for communication between different tasks.

Q. 37 Explain the term multitasking with a suitable example.

(Oct. 2003, 2013)

Ans. :

- 1) Multitasking : A task can be defined as an asynchronous code path within a process. In multitasking, a process can consist of tasks, which run simultaneously.
- 2) Multiple tasks should be able to run concurrently within a process.
- 3) Multitasking allows programmer flexibility and improves CPU utilization.
- 4) It reduces the overheads of switching at a process level.
- 5) For example :

Consider a process consisting of two tasks :

Task 0 : Read a Record

 Process a Record

 Task 0 end

Task 1 : Write a Record

 Task 1 end

- (a) Two task are defined within the same process. They run concurrently within the same process if synchronized properly.
- (b) If task 0 is blocked, instead of blocking entire process, the operating system will find out whether tasks 1 can be scheduled.

- (c) When both tasks are blocked, only then entire process is blocked. Again if one task is ready, the process can be moved to ready list and then scheduled.

Q. 38 What are the advantages of multitasking operating systems ?

Ans. :

- (i) Multitasking O.S. allows programmer flexibility and also improves C.P.U. utilization.
- (ii) When various tasks are defined in a process, then process would be blocked only if all the tasks in that process are blocked.
- (iii) Again even if any task becomes ready, the process can be moved to ready list from blocked list.
- (iv) By adding task levels, context switching at various process levels can be reduced.
- (v) Multitasking is less time consuming and it reduces turnaround time.

Q. 39 Explain multiuser and time sharing operating systems.

(March 2015, 2020)

Ans. : In computing, time-sharing is the sharing of a computing resource among many users by means of multiprogramming and multi-tasking

Time sharing is a technique which enables many people, located at various terminals, to use a particular computer system at the same time. Time-sharing or multitasking is a logical extension of multiprogramming. Processor's time which is shared among multiple users simultaneously is termed as time-sharing. The main difference between Multiprogrammed Batch Systems and Time-Sharing Systems is that in case of Multiprogrammed batch systems, objective is to maximize processor use, whereas in Time-Sharing Systems objective is to minimize response time.

Multiple jobs are executed by the CPU by switching between them, but the switches occur so frequently. Thus, the user can receive an immediate response. For example, in a transaction processing, processor executes each user program in a short burst or quantum of computation. That is, if n users are present, each user can get time quantum. When the user submits the command, the response time is in few seconds at most.

Operating system uses CPU scheduling and multiprogramming to provide each user with a small portion of a time. Computer systems that were designed primarily as batch systems have been modified to time-sharing systems.

Advantages of Timesharing operating systems are following

- (i) Provides advantage of quick response.
- (ii) Avoids duplication of software.
- (iii) Reduces CPU idle time.

Disadvantages of Timesharing operating systems are following.

- (i) Problem of reliability.
- (ii) Question of security and integrity of user programs and data.
- (iii) Problem of data communication.

Q. 40 Explain various disk space allocation with their merits/demerits?

Ans.: There are two major types for the allocation of disk space to files these are:

1. Contiguous allocation

2. Non-contiguous allocation

1. Contiguous allocation :It requires each file to occupy a set of contiguous address on the disk. An unallocated segment is called hole. If a new file is created and there are set of holes then following strategies is used. Select a free hole from set of holes

1. First Fit - This allocate first hole that is big enough.
2. Best Fit - This allocate the smallest hole that is big enough.
3. Worst Fit - This allocates largest hole.

Merits - If processing is sequential and if the operating system uses buffered I/O, the processing speed can increase.

Demerits - Disadvantages of contiguous allocation is space wastage and inflexibility.

2. Non-contiguous allocation :In this maximum size of the file does not have to be predicted at the beginning. The file can grows with time as per needs. This reduces wastage of space.

Merits - Operating system automatically allocates additional blocks, if the file gets full during the execution of program without aborting the program.

There are two methods of non-contiguous allocation these are.

1. Chained allocation
2. Indexed allocation

1. Chained allocation :It is used in non-contiguous allocation. In this each file is a linked list of disk blocks, the disk blocks may be scattered anywhere on the disk. The directory contains a pointer to the first and last block of the file. Create a file in this allocation is easy.

Merits - 1. There is no external fragmentation 2. There is no need to declare size of file when it is created.

Demerits - 1. Each file require space for pointer 2. If a pointer is lost then can't open file.

2. Indexed allocation :In this all pointer are brought together into one location called indexed block. Each block has its own index block, which is an array of disk block address. An index can be a list of pointers. Index allocation support access, without suffering, from external fragmentation. The index block is normally on the disk block which can be read or written by itself.

Q. 41 Contrast contiguous verses non-contiguous memory management system.

Sr. No.	Contiguous memory management	Non-contiguous memory management
1.	This system expect the program to be loaded in contiguous memory location.	In this system program is divided into different chunks and to be loaded at different portions of the memory.
2.	Example - Single contiguous memory management system, Fixed partition memory management system.	Example - Paged memory management system, segmented and combined system, segmented and combined memory management system.

CONCEPTS RELATED TO MEMORY MANAGEMENT

Q. 42 What functions are performed by memory management of operating systems ? State any four memory management systems.

(March 2003, 04, 07, 12, 13, 14, 17, 19; Oct. 2006, 2013)

Ans. :

- 1) In general, the memory management modules performs following functions :
 - a) To keep track of all memory locations free or allocated and if allocated, to which process and how much.
 - b) To decide memory allocation policy i.e. which process should get how much memory when and where.
 - c) To use various techniques and algorithms to allocate or deallocate memory locations. Normally, this is achieved with the help of some special hardware.
- 2) The following are the memory management systems :
 - A) Contiguous, Real Memory Management System :
 - (a) Single contiguous
 - (b) Fixed partitioned
 - (c) Variable partitioned
 - B) Non-contiguous, Real Memory Management System :
 - (a) Paging
 - (b) Segmentation
 - (c) Combined
 - C) Non-contiguous, Virtual Memory Management System :
 - (a) Virtual memory

Q. 43 Explain memory map of single user operating system.

(March 2004, 2007, 2011, 2020)

Ans. :

Free memory
Process
Command interpreter
Kernel

Memory map of single user OS

- (1) The operating system like MS-DOS is single user O.S.
- (2) The memory map of such operating systems consists of program to be executed i.e. process, free memory available, command interpreter and kernel.
- (3) The command interpreter of the single user operating system is invoked when the computer is started.
- (4) This O.S. loads program to be executed in main memory and assigns as much memory as possible to it. It then sets instruction pointer and executes the program.
- (5) If the program is terminated, then it is removed from memory.
- (6) The kernel of such O.S. provides basic operating systems services, while the command interpreter interprets the commands.

Q. 44 What is partitioning ? Explain fixed and variable partitioning.

(Mar. 2004, 07, 08, 09, 12; Oct. 2005, 14, July 2017, 18)

Ans. : Certain operating systems use partitioned memory management to allow multiprogramming. Partitioning means dividing main memory into various sections. These sections are called partitions.

There are two types of partitions :

- I) Fixed partitions II) Variable partitions

I) Fixed partitions (Static Partition) :

- (1) In fixed partitioning, partitions could be of different sizes. But once decided, their size can not be changed.
- (2) In this method partitions are fixed at the time of system generation. At this time, system manager has to declare the partition size.
- (3) Fixed partitions are also called as static partitions. On declaring fixed partitions, the operating system creates Partition Description Table (PDT).

II) Variable partitioning :

- (1) In variable partitioning number of partitions and their sizes are variable.
- (2) They are not defined at the time of system generation.
- (3) These partitions are created by the operating system at run time they differ in size.
- (4) The procedure to be followed for memory allocation is nearly same as that in case of fixed partitions.
- (5) At any time, any partition may be free or allocated to some process. Also, in variable partitioning, starting address of partition is not fixed.

Q. 45 Explain difference between fixed partition and variable partition.

Ans.:

Sr. No.	Fixed Partition	Variable Partition
1.	Partition created could not be changed.	Partition created can be changed.
2.	Partition can be defined at the time of generation.	Partition cannot be defined at the time of generation.
3.	It suffers from problem of internal fragmentation.	Problem of internal fragmentation is solved.
4.	No. of partition and their sizes are fixed.	No. of partition and their sizes are variable.

Q. 46 Give the disadvantages of fixed partition.

Ans.:

- (i) Fixed partitioning suffers from internal fragmentation i.e. wastage of memory space within the partition e.g. suppose the partition size is 200k and a job is of 100k, then 100k of memory will be wasted.
- (ii) Fixed partitioning reduces degree of multiprogramming.
- (iii) It also restricts C.P.U. utilisation.

Variable partitioning overcomes these problems and hence it is widely accepted.

Q. 47 State the various steps involved in the allocation of a partition in case of fixed partition memory management. (March 2002, 2005, 2006, 2007, 2017/Oct. 2003, 10, 12)

Ans. : When a process is to be allocated a partition, following take place :

- The long term process scheduler of the PM decides which process to be brought in to the memory.
 - It then finds out the size of the program to be loaded by consulting the IM portion of the O.S. The compiler keeps the size of the program in the header of the executable file.
 - Then makes a request to the partition allocation routine of the MM to allocate a free partition, with the appropriate size.
- The partition description table (PDT) is useful for this procedure.
- With the help of the IM module it now loads the binary program in the allocated partition.
 - It then makes an entry of the partition ID in the PCB (process control block) before the PCB is linked to the chain of ready processes by using the PM module of the operating system.
 - The routine in the MM now redefines partition description table and marks the status of that partition as allocated. (ALLC)
 - The PM eventually schedules this process.

A partition description table (PDT) is shown in Fig. below :

Partition ID	Starting Address	Size	Status
0	0	100K	FREE
1	100K	300K	ALLC
2	400K	200K	ALLC
3	600K	300K	FREE
4	900K	100K	ALLC

PDT

Fixed partition

Q. 48 Explain the single contiguous memory management systems with a suitable memory mapping diagram. (March 2005, Oct. 2010)

Ans. : Single contiguous memory management system :

- In this memory management system, the physical memory is divided into two contiguous areas. One is permanently allocated to the resident portion of the operating system and the remaining used for user process.
- As shown in figure operating system may be loaded at lower addresses i.e. 0 to P. At any time, only one user process is in the memory. This process is run to completion and then the next process is brought in the memory.

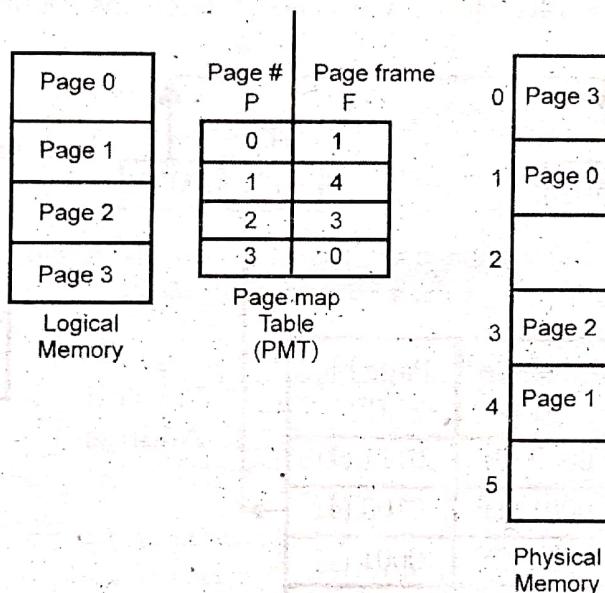
Scanned with OKEN Scanner

- Q. 49** What is paging ? Explain in detail. OR
 Explain page memory management system with a suitable page map Table (PMT)
 (March 11, 19, Oct. 2004, 15, July 2016)
 (Oct. 2008, Dec. 2020, March 2022)

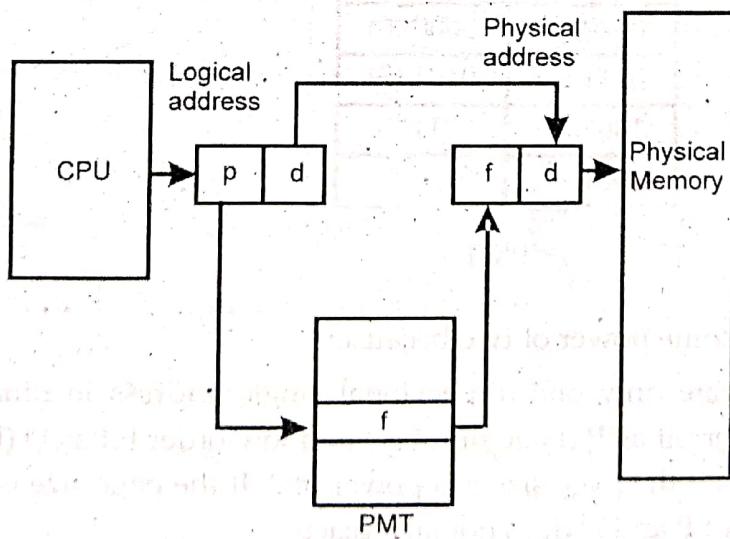
Ans. :

- Partitions suffer from external fragmentation because of available memory is not contiguous.
- Paging permits a program's memory to be non-contiguous allowing a program to be allocated physical memory wherever it is available.
- Physical memory is broken into fixed-size blocks called Page Frames. Logical memory is also broken into blocks of the same size called Pages.
- When a program is to be executed its pages are loaded into any available frames and the page map tables defined to translate from user pages to memory frames.
- The page size is defined by hardware. It is typically power of 2.

The paging model of memory is shown as follows :



- Every address generated by CPU is divided in two parts :- a page number (p) and a page offset / displacement (d). The page number is used as an index into a PMT.

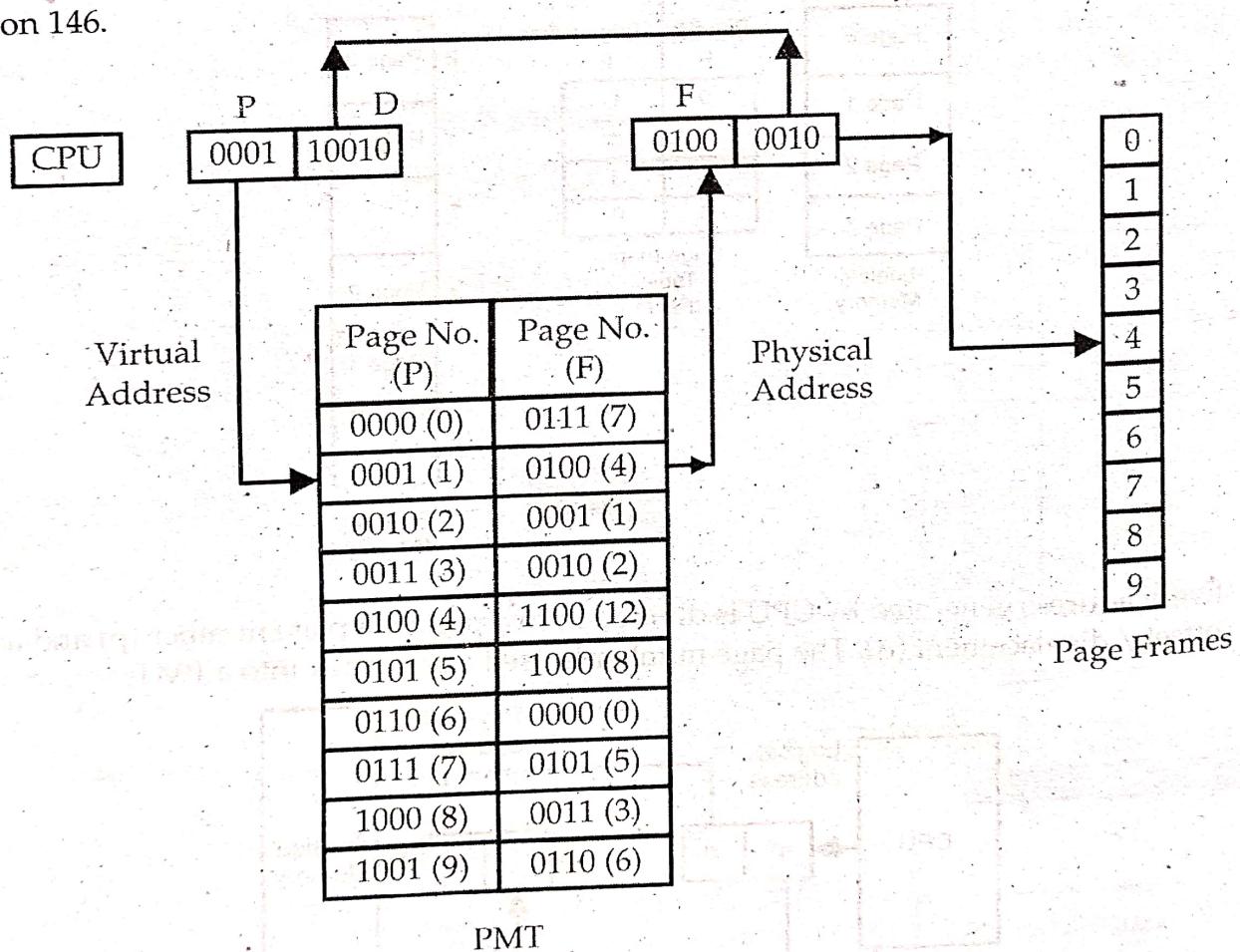


Q. 50 Explain address translation mechanism in paging? Why is the page size normally some power of two?

Ans. :

Let us assume that we have a machine where a word length is 8 bits. Let us also assume that our machine has main memory with capacity of 512 bytes or words. This memory is divided into 16 pages of 32 words each ($16 \times 32 = 512$). Hence we require 4 bits to represent page number P (0 to 15) and 5 bits to represent displacement D (0 to 31). Therefore total number of bits in address will be 9 (4 + 5).

The address generated by compiler is divided into page number [P] and displacement I. If any instruction at virtual address 50 is to be executed then compiler generates P = 1 and D = and in binary P = 0001 and D = 10010. But figure shows that page is mapped onto page frame 4 and thus Physical address of instruction is in page 4 at displacement 18. Page frame 4. It will contain physical address $128 + 18 = 146$. Hence we need to fetch instruction not at location but at location 146.



Page size is normally some power of two because:

Compiler generates only one dimensional single address in binary these addresses are divided into high order bit as P (Page number) and low order bit as D (Displacement in page) which only happens if the page size is a power of 2. If the page size is not a power of 2, this automatic separation of P and D does not take place.

Q. 51 What is segmentation?

(March.2011, Oct. 2004, Dec. 2020)

Ans. :

- (1) Segments are logical divisions of programs and hence are normally of variable sizes.
- (2) Segmentation is a memory management scheme which support user's view of memory.
- (3) Each segment has number and length.
- (4) Each program in executable form can be considered to be consisting of different segments such as code, data and stack. Each of these can be further divided into new segments.
- (5) A program normally contains main program, some subprograms and few predefined and precompiled functions. Each of these belongs to different segments.
- (6) An application programmer does not necessarily have to declare different segments in the program. If various segments in his programs does not define explicitly, then the compiler does it by its own. Following are the jobs of compiler :
 - i) Recognize different segments in program.
 - ii) Number those segments.
 - iii) Define segment table
 - iv) Produce an executable image by assigning two dimensional addresses.
- (7) Consider the examples as shown in figure Four segments numbered 0 to 3. The SMT (Segment Map Table) has separate entry for each segment giving the size and base of segment.

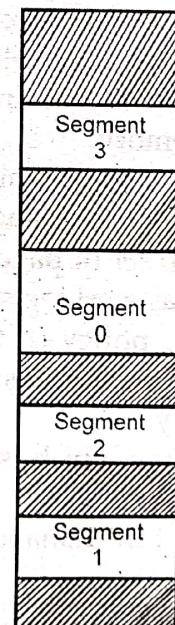
Main Program Segment 0	0 999	Sub program Segment 1	0 399
---------------------------	----------	--------------------------	----------

Stack area Segment 2	0 299	Data area Segment 3	0 199
-------------------------	----------	------------------------	----------

Segments

Segment #	Limit	Base
0	1000	1400
1	400	3400
2	300	2900
3	200	500

Segment map table



Q. 52 Differentiate between Paging and Segmentation.

(Oct. 2011)

Ans.:

Sr. No.	Paging	Segmentation
1.	Pages are physical in nature.	Segments are logical division of programs.
2.	Pages are of fixed size.	Segments are of variable size.

Sr. No.	Paging	Segmentation
3.	Page table translate from user pages to memory frames.	The segment table has a separate entry for each segment in physical memory and length of that segments.
4.	In paging, logical memory is divided into physical memory.	In segmentation main program is divided into segments.

(March 2004, 15, 16; July 2019)

Q. 53 Explain the concept of virtual memory in brief.**Ans. :**

- (1) Virtual memory is an attempt, which makes the execution of the processes possible, which may completely not in the main memory. Some part of the process may be on disk.
- (2) The MM techniques are simple to implement but the major drawback is that if the physical memory is limited then number of processes it can hold at any time i.e. degree of multiprogramming reduces. For this concept of virtual memory is introduced.
- (3) The main advantage of virtual memory is user can execute programs, whose size may be greater than the physical memory.
- (4) Virtual memory is difficult to implement. It can be implemented by paging segmentation or combined schemes. Mostly virtual memory systems are implemented by using paging.
- (5) A program consists of number of logical or virtual pages. To start execution of program, some of the pages are loaded into specific page frames. If a page is not loaded into memory and a location from that page is referenced, at that time a page fault arises. When a page fault arises the O.S. loads the referenced page in memory from disk.
- (6) Generally virtual memory is related to following concepts :
- (i) Locality of reference : In locality of reference it is forecast whether a page is likely to be referenced in near future or not depending on its behavior in past and hence may be removed from memory.
 - (ii) Page fault : When a page, which is not in main memory is referenced, then a page fault arises. At this time the O.S. loads that page in main memory.
 - (iii) Working set : The set of pages in physical memory which are actively referred to any moment is called as working set. Working set helps to decide page replacement policy.
 - (iv) Page replacement policy : If there is no page frame in main memory to accommodate new page, the O.S. overwrites some existing pages. These pages are determined by page replacement policy.
 - (v) Dirty page : A page which is modified after it is loaded in main memory is called as dirty page.
 - (vi) Demand paging : In demand paging, a page is loaded in memory, only when it is demanded.

Q. 54 Explain the following terms.

(Oct. 2007, 14, 21)

Ans. :

- (1) Locality of reference :
- i) The basic principle behind virtual memory is called locality of reference.
 - ii) This gives some basis to forecast whether a page is likely to be referenced in the near future or not, depending on its behavior in past.

- iii) Thus, it helps to decide whether the page should be thrown out from main memory to make space for new page or not.
- iv) If this principle is not valid, user can not throw any pages out on the disk from memory without a possible severe degradation in the performance.

(2) Page fault :

(March.2011, Oct. 2006, 21)

- i) In many systems, when a process is executing with only a few pages in memory and when an instruction is encountered which refers to any instruction or data in some other page which is outside the main memory i.e. on the disk, a 'page fault' occurs.
- ii) At this stage, the operating system must bring the required page into the memory before the execution of that instruction can restart.

(3) Working set :

(March.2011, Oct. 2006, 21)

- i) At any time, a process has a number of pages in the physical memory. Not all of these are actively referred.
- ii) The set of pages in the physical memory actively referred to at any moment is called working set.
- iii) This has a significant bearing on the policy of bringing in pages from the disk to the main memory, if the operating system follows the "Working set model."

(4) Page replacement policy :

(March.2011, Oct. 2006)

- i) As the number of processes and the number of pages in the main memory increase all the page frames become occupied.
- ii) At this time, if a new page is to be brought in, the operating system has to overwrite some existing page in the memory.
- iii) The page to be overwritten is selected by page replacement policy.
- iv) There are a number of ways in which the O.S. selects the page to be overwritten. The O.S. designer chooses one amongst many of such policies and writes corresponding algorithm for it.

(5) Dirty page / Dirty bit :

(March.2011, Oct. 2006)

- i) The page which is modified after it is loaded in main memory from disk is called as dirty page.
- ii) The operating system maintains one bit for each physical page frame to denote whether a page has become dirty or not. This bit is called dirty bit.

(6) Demand paging :

(Oct. 2021)

- i) In demand paging, a page is brought in only when demanded.
- ii) Consider a process is created with no pages in main memory. When the process is dispatched initially, the program counter will have been loaded with the address of first instruction. This address obviously belongs to a page outside the main memory. So a page fault will occur and the O.S. will now bring that page in memory.
- iii) In this way as page fault goes on occurring, the O.S. brings new referred pages. This is called demand paging.
- iv) The drawback of demand paging is that a lot of pages which have been used in past, but which now are not required, remain in memory unnecessarily.

Q. 55 What is dirty page, dirty bit? How are they used?

Ans.:

If the page in memory has been modified after it was loaded from the disk is called page.

The operating system maintains one bit for each physical page frame to denote whether a page has became dirty or not. This bit is called 'dirty bit'.

The hardware is normally designed in such a fashion that if a page is modified, the dirty bit for that corresponding page frame is set to 1 automatically; otherwise, it is at 0.

If a page is dirty, it cannot be blindly overwritten, because otherwise the updates will be lost. Hence in such a case, this page has to be written back onto the disk at a proper place, so that when it is brought in next time, the correct and current copy is brought in. If the page is not modified i.e. clean, the operating system need not write it back. In this way, a lot of time is saved.

GUI

Q. 56 What is GUI ? State any four advantages of GUI. [Oct. 2003, 2006, 2007, July 2017]

Ans. :

GUI : The interface which replaces cryptic commands by their graphical representation are called Graphical User Interface (GUI)

Windows operating system is GUI based operating system.

Advantages of GUI :

- 1) With GUI, commands are replaced by graphics. Hence it is not necessary to remember the command and its meaning.
- 2) With GUI, user can run several programs simultaneously.
- 3) User can communicate and exchange data between programs without transferring or copying files.
- 4) Easy to use, consistent GUI for virtually all programs.

Q. 57 What is GUI ? Explain in brief any two features of GUI [March 2005, 2012 Oct. 2006]

Ans. :

GUI : The interface which replace cryptic commands by their graphical representation are called Graphical User Interface (GUI).

Windows operating system is GUI based operating system.

Features of GUI :

- 1) Replacement of command with icons :
 - (a) Commands are grouped together in various levels of hierarchy and when the user selects a group, further commands in that group are displayed.
 - (b) This allows the user to select a command using a cursor and simply clicking on it.
 - (c) User can select the command and use the application without first having to know about the computer and its working.
 - (d) The display of these command sequences takes place graphically.

2) Provide on-line HELP :

- (a) GUI - based applications provide "HELP" about various features of the application.
- (b) HELP can assist the user in knowing everything about the application.
- (c) In the windowing environment, if user gets confused at any point, a HELP is readily available. This makes GUI-based applications more popular and efficient.

Q. 58 What is meant by GUI ? What are the essential components of GUI ? Explain any three. (March 2004, 18, Oct. 2004, 12, 15, July 2018, 19)

Ans. : GUI : The interface which replace cryptic commands by their graphical representation are called Graphical User Interface (GUI).

Windows operating system is GUI based operating system.

Essential components of GUI are :

- (1) Menu bar
- (2) Scroll bar
- (3) Controls push button, option button, radio button, check box, list box, Entry box, Combo box
- (4) Dialogue boxes
- (5) Feedback pointer

1) Menu bar :

- (i) Menu bar normally appears at the top of the window under the window title.
- (ii) Some commonly used menu bar options are File, Edit, View, Help etc.
- (iii) When one of these menu is selected, a pulldown menu appears on the screen.

2) Scroll bar :

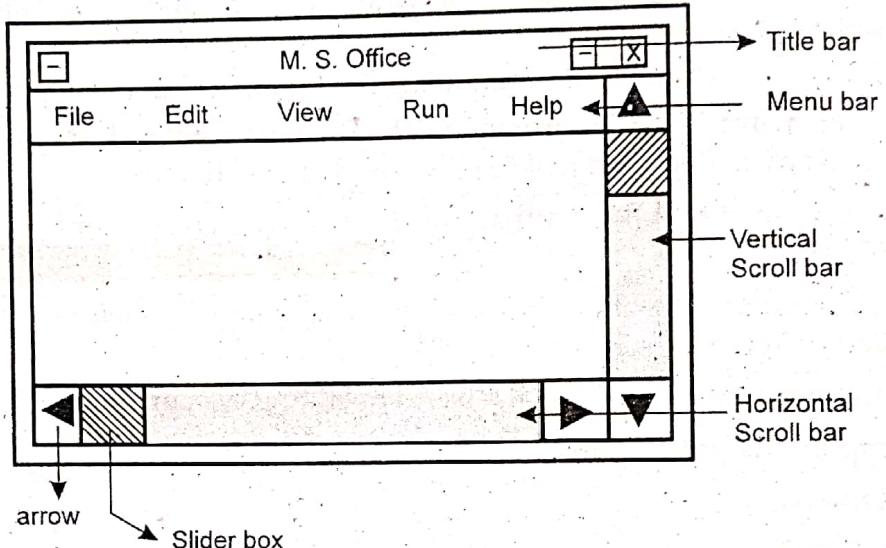
- (i) Scroll bars allow user to scroll window horizontally and vertically.
- (ii) Scroll bars are generally used to look at information, which is not currently visible in screen, by scrolling window horizontally or vertically.
- (iii) A scroll bar consists of a horizontal or vertical scroll area with a slider box and an arrow in a box at each end.
- (vi) Slider box gives a hint on size and position of the visible part of object.

3) Dialogue boxes :

- (i) Dialogue box is a window, used by the application to interact with the user.
- (ii) A dialogue box can also be used to display information or to get user input and also for a combination of these two functions.
- (iii) Dialogue boxes are of two types : (i) Modal dialogue box (ii) Modeless dialogue box.
- (iv) A dialogue box where an application can continue only after the user has responded to the dialogue is called modal dialogue box.
- (v) A dialogue box , which allows user to continue without responding to it is called modeless dialogue box.

Q. 59 Explain in short the function of Menubar and scroll bar components of G.U.I.
(March 2002, 2008, 2011)

Ans. :



(i) Menubar :

- i) A menubar consists of different main menus, which can be used in program.
- ii) The main menus consists of different submenus. A menu can be selected by clicking it.
- iii) A menubar is normally present at the top of the window under the window title. Some of the commonly used menu options are File, Edit, Help etc.
- iv) When one of these menu is selected by clicking, a pull down menu list appears on the screen.
- v) A pull down menu is a rectangular box, with more specific action listed in the box, out of which one can be selected by clicking a particular menu item.
e.g. In pull down menu of "file"
 - (i) Open : opens required document by giving browsing window.
 - (ii) Print and Save : prints and saves current document.

(ii) Scroll bars :

(March 2007)

- i) Scroll bars allow user to scroll window horizontally and vertically.
- ii) Scroll bars are generally used to look at information, which is not currently visible in screen, by scrolling window horizontally or vertically.
- iii) A scroll bar consists of a horizontal or vertical scroll area with a slider box and an arrow in a box at each end.
- iv) Slider box gives a hint on size and position of the visible part of object.

Q. 60 Explain the following with respect to GUI : (ii) Title bar.

(March 07, March 18)

Ans. :

1. Title bar appears at the top of the window.
2. Title bar shows the title of each window.
3. The title helps to identify each window separately

Q. 61 Explain various controls of G.U.I.

Ans. : A variety of controls are used in a G.U.I. to enable user to select type of information or to select specific operation to be carried out. That are either buttons or boxes. Some of the control buttons are :

1) Push button :

It is a rectangular button having a label, indicating action to be carried out. This button is used to select an action represented by button. This button normally used when one action is to be selected at of many choices.

For e.g. **SAVE**

2) Option button or radio buttons :

It consists of a graphical image, which is used to select one object out of several possible objects. The currently selected can be distinguished from the others by highlighting on the graphic image :

e.g. Workarea

Modeless

Application.

3) Check buttons :

A check button consists of a square box and an accompanying text. This is used for selecting one or more choices from a list of options.

e.g. Auto manager

Default position

Align

4) The Box controls are list box and entry box :**(i) List box :**

A list box is a rectangular box with scroll bars. This allows user to select one item from a scrollable list of choices.

(ii) Entry box :

Entry box is a rectangular box, which allows user to enter some text. An additional hint about the type of text to be entered is provided near the box.

Q. 62 What are dialogue boxes ?

Ans. :

- i) Dialogue box is a window, used by the application to interact with the user.
- ii) A dialogue box can also be used to display information or to get user input and also for a combination of these two functions.
- iii) Dialogue boxes are of two types : (i) Model dialogue box (ii) Modeless dialogue box.
- iv) A dialogue box where an application can continue only after the user has responded to the dialogue is called model dialogue box.
- v) A dialogue box, which allows user to continue without responding to it is called modeless dialogue box.

Q. 63 What is Windows ? What are the operations that can be performed on a window ?

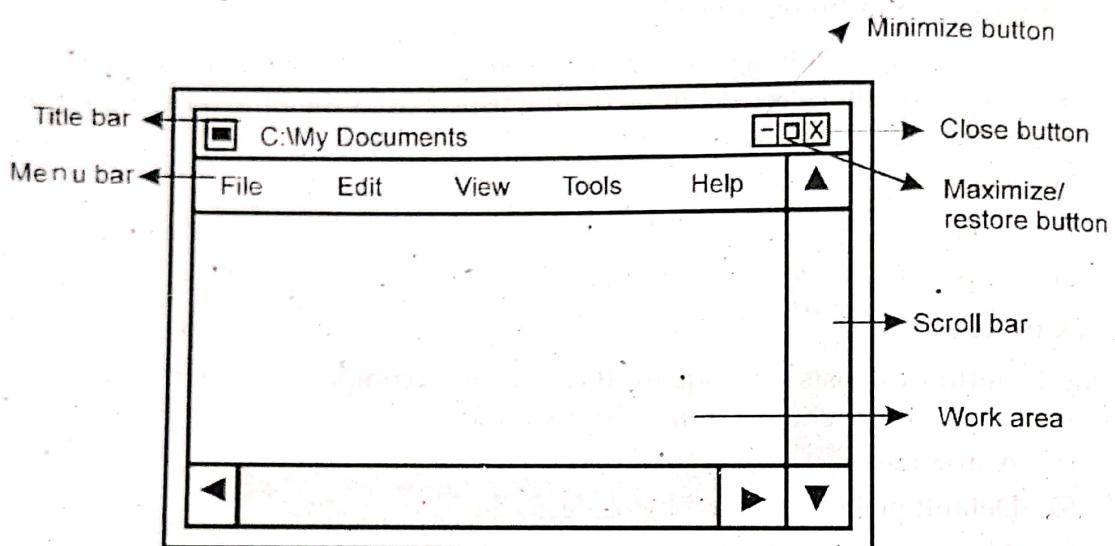
(Oct. 2005)

Ans. : Different applications are shown on computer screen by icons. User can open one or more applications at a time by clicking them.

The computer screen is divided into different partitions. Each partition can be of different size. User run different application in each partition of the screen. Each of these partition is called a window.

Windows are independent of each other.

A typical computer window is shown in figure below :



Following operations can be carried out on a window :

(i) Dragging the window :

(Oct. 2005)

- 1) The position of the window on screen can be changed by dragging it.
- 2) To drag a window select a window by clicking mouse, keep the left button of the mouse pressed with mouse pointer on the title layer of windows.
e.g. on the layer in which c:\My documents is written in above example.
- 3) Move the mouse pointer to new position, it will find that the window is shifted to new position.

(ii) Resizing window :

(Oct. 2005)

Making change in the size of window is called resizing window.

A window can be resized as follows :

- 1) Move the mouse pointer to right/left side border of windows.
- 2) Observe that the shape of mouse pointer gets changed to left/right arrow.
- 3) Now press the left button of mouse and move the mouse arrow to right/left side to a new position. Observe that right/left border of window is moved.
- 4) Similarly we can move top/bottom border of window.

Thus we can resize the window.

(iii) Minimize/Maximizing Window :

(March 2007, Oct. 2005, 2008, July 2010)

We can minimize/maximize or close a window by pressing minimize/maximize or close the button respectively which are present at the top in the right corner of the window.

Q. 64 Explain in brief the following programs of MS-Windows :

- (i) Program Manager
- (ii) File Manager
- (iii) Control Panel

(March 2003, 2007, 2009, 2013)

Ans. : MS-Windows environment provides following programs which play very important roles.

1) **Program Manager :**

- (a) The Program Manager starts executing along with MS-Windows.
- (b) This provides user interface to start and stop applications.
- (c) It is used to organize various applications into different groups.
- (d) It also indicates how each group contents are controlled and displayed on the screen.
- (e) It is also used to end the MS-Windows session.

2) **File Manager :**

- (a) This helps organize user files and directories.
- (b) This is used to traverse through the file system and change drives, to search, copy, move, create or delete files and directories.
- (c) Applications can be started directly from the File Manager.

3) **Control Panel :**

- (a) It can be used to choose or change the color schemes in the applications, select and display the background of the screen, select border width and other border characteristics, cursor size and shape etc.
- (b) Fonts also managed by controlpanel.
- (c) It is also used to configure printers and other ports on the PC.

Access and Security Aspects of O.S.

Q. 65 Define "security" with respect to an operating system. Explain the different elements of security?

(Oct. 2002, 2004, 2010, 2012, March 2018)

Ans. :

- 1) Security is concerned with the ability of the operating system to enforce control over the storage and transportation of data in and between the objects, that the operating system supports.
 - 2) In multiuser operating systems, the concepts of security and protection are very important. User programs should not interfere with one another or with the operating system.
 - 3) In general, Secure Systems are those, which control, through the use of specific security features, access to information that only properly authorized individuals or processes operating on their behalf will have access to read, write, create or delete.
 - 4) There are three main elements of security viz. Confidentiality, integrity and availability.
- (i) **Confidentiality :**
- Confidentiality ensures that information is not accessed in an unauthorized manner. It is generally related to the Read operations.

(March 2005; Oct. 2006, 2008; July 18)

(ii) Integrity :

(March 2005; Oct. 2006, 2008)

Integrity ensures that the information is not amended or deleted by an unauthorised manner. It is generally related to Write operations.

(iii) Availability :

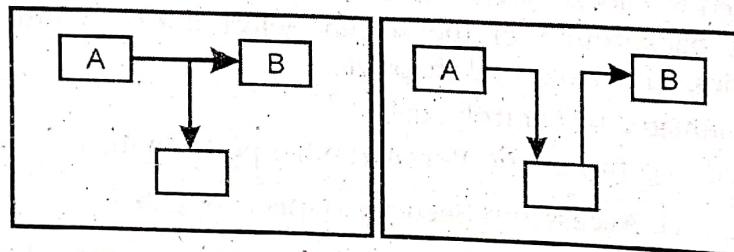
(March 2005; Oct. 2006, 2008)

It ensures that information is available to the authorised users at right time.

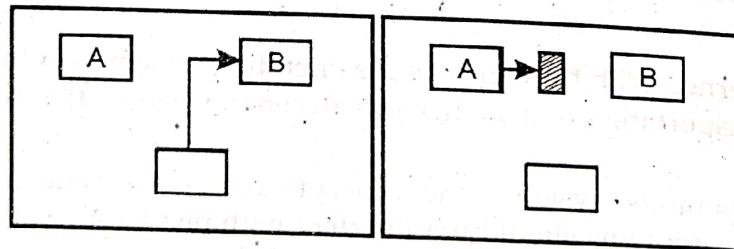
Q. 66 Discuss in brief threats to security in any computing environment.

Ans. :

- 1) Sharing and protection are requirements of modern computing environments. But these two are contradictory to each other as more sharing gives rise to possibility of more security threats.
- 2) The major threats to security in any computing environment can be categorized as follows :
 - (i) Tapping : Unauthorised use of servicing.
 - (ii) Disclosure : Unauthorised disclosure to information.
 - (iii) Amendment : Unauthorised alteration or deletion of information.
 - (iv) Fabrication : Unauthorised fabrication of information.
 - (v) Denial : Denial of service to the authorized users.
- 3) The security threats are shown in the following figure.



Tapping/Disclosure (i, ii) Amendment (iii)



Fabrication (iv)

Denial (v)

- 4) Out of these five security threats, the first two, viz. tapping and disclosure, are categorized as passive threats and the other three as active threats.
- 5) It is clear that in both the cases (i) and (ii), information goes to the third party. But, the difference is that in tapping the third party accessed information without knowledge of the other two parties. Whereas in disclosure the source party willingly discloses information to the third party.

Q. 67 What are attacks on security ? Explain in short the ways in which a system can be attacked.
(Oct. 2005, July 2016, 18)

Ans. : The security system can be attacked and penetrated in a number of ways as follows :

1. Authentication :

Authentication means verification of access to the system resources. Following are some of the ways in which authentication may take place :

- (i) By stealing and using somebody else's password and then use it.
- (ii) Use of vendor supplied password which can be used by only system administrator.
- (iii) Finding password by trial and error (i.e. guess) method.
- (iv) If a user logs on and then goes off, an intruder can use that terminal.
- (v) Writing dummy login programs to fool the user.

2. Browsing :

- (i) In some systems, there exist files with access controls, which are very permissive.
- (ii) One can browse through the system file to get this information, after which unprotected files/databases could be easily accessed.
- (iii) Confidential information could be read or even modified.

3. Trap doors :

- (i) Sometimes, software engineers leave some secret entry point to modify their programs. These are called trap doors.
- (ii) They can be misused by others.

4. Electric data capture :

Use of active or passive wire traps, or mechanism to pick up the screen radiation and to recognize what is displayed on screen is called electric data capture.

5. Invalid parameters :

Passing invalid parameters may cause serious security violations.

6. Line trapping :

A special terminal is used to tap into a communication line. It causes access to confidential data.

7. Waste recovery :

By using some technique, deleted files can be recovered, password may be recollected.

8. Rouge software :

Certain programs like worms, viruses attack on system.

Q. 68 What are computer worms ? Explain its mode of operation.

(Mar. 2003, 13 Oct. 2010, 13)

Ans. :

- 1. A computer worm is a complete program by itself. It is written in such a way that it spreads to other computers over a network.
- 2. But, while doing this, it consumes the network resources to a very large extent.
- 3. A computer worm can potentially bring the entire network to a grinding halt.

Mode of Operation :

4. Usually a computer worm does not harm other programs or data.
5. It just spreads, thereby consuming large resources such as transmission capacity or disk storage. It denies services to legitimate users.
6. A computer worm usually operates on a network. Each node on network maintains a "mailing list", which contains the names and addresses of the reachable machines on the network. The worm gets access to this list and using this, sends a copy of itself to all those addresses.
7. If the worm is intelligent, after reaching a node it checks whether a copy of itself already exist there or not. If exists, it does not create one more copy.
8. If the worm is dumb, it just copies itself to all nodes. So, if one node's address is at several places in network, then it would have several copies of the worm.
9. Safe guards against worms :

A worm can be prevented by strong security and various check points on the communication system.

Q. 69 What is a computer virus ? State various types of viruses and the basis on which they are classified.

(March 2002, 06, 07, 11, 17, 20, 22, Oct. 2007, 15, 21, July 17, 19, Dec. 2007)

Ans. :

1. A computer virus is a part of program, which is written with clear intention of infecting other programs.
2. A computer virus is not a complete program by itself. It can not act independently.
3. A computer virus causes direct harm to the system. It can corrupt code as well as data.
4. The classification of virus is based on what do it affects or where the virus resides.
5. There are five types of viruses given below :
 - (i) Boot sector virus
 - (ii) Memory resident virus
 - (iii) File specific virus
 - (iv) Command processor virus
 - (v) General purpose virus.

Q. 70 What are the different methods by which virus can infect other programs ?

(March 2005, 11, 17, 20, 22, Oct. 2007, 15, 21, July 2017)

- Ans. :** There are five well known methods by which a virus can infect other programs :
- (i) Append : In this method the viral code appends itself to the unaffected programs.
 - (ii) Replace : In this case, the viral code replaces the original executable program completely or partially to carry out some funny actions.
 - (iii) Insert : In this case, the viral code is inserted in the body of an executable code to carry out some funny or undesirable actions.
 - (iv) Delete : In this case, the viral code deletes some code from the executable program.
 - (v) Redirect : This is an advanced approach employed by the authors of sophisticated viruses. The normal control flow of a program is changed to execute some other code, which could exist as an appended portion of normal program.

Q. 71 How generally a virus operates ?

Ans. :

1. A virus works in a number of ways. Normally, the developer of a virus has to be a very bright person who knows the operating system very well in order to break it.

2. This person produces interesting or useful program such as a good game or utility. However, this program has some viral code embedded in it.
3. Typically, it is developed under MS-DOS, as viruses are very popular on the PCs.
4. This program is then published on the public bulletin board system or it is distributed to people free of charge.
5. Tempted by its contents and the price, the user acquires it and then starts using it after copying it onto the machine.
6. At this stage, the virus can be said to be in a nascent state. After executing the game or the utility i.e. the host program, the virus also executes, which allows it to spread to other programs on the machine and infect them.

Q. 72 Discuss virus detection, removal and prevention philosophies.

(Mar. 2008, 11, 16, 17, 19; Oct. 2003, 05, 13, July 2016)

Ans. :

(i) Virus detection :

1. Normally, a virus detection program checks the integrity of the binary files.
2. The program maintains a check sum on each file. A mismatch in it indicates virus.
3. Some programs reside in the memory and continuously monitor certain memory and I/O operations for guarding against any suspicious behavior.

(ii) Virus removal :

1. A generalized virus removal program is very difficult to imagine due to the multiplicity of the viruses and the creativity with which they are constructed.
2. However, for some viruses, bit pattern in code can be predicted.
3. In this case virus removal program scans the disk for the patterns of known viruses. On detection, it removes them. But, if the virus has already damaged data, then recovery of data is almost impossible.

(iii) Virus prevention :

1. User cannot cure the data (recover) after viral affection. Hence the best way is to prevent viruses.
2. For this user must buy official, legal copies of software from reliable stores or sources.
3. One should be extremely careful about picking up free, unreliable or illegal software.
4. Frequent back-ups and running of monitoring programs also help in detection, and thus subsequent prevention of different viruses.

Q. 73 Differentiate between computer worms and computer viruses.

(March 2004, 09, 12, 14, 15, 19; July 18, Dec. 2020)

Ans. : Computer worms :

- i) A computer worm is a complete program.
- ii) A computer worm can act independently.
- iii) Generally it does not cause direct harm to the computer system.
- iv) It just goes on spreading on to network and consumes network resources to a large extent.

Computer viruses :

- i) A computer virus is not a complete program, but a part of program.
- ii) A computer virus can not act independently.
- iii) It causes direct harm to the computer system. It has been written with clear intention of infecting others.
- iv) A computer virus corrupts code and data.

Q. 74 What is the difference between a Worm and a Virus ? Explain how these can be prevented. **(March 2004)**

Ans. : Difference between a Worm and a Virus : Refer Q. No. 73.

- 1) **Worm Prevention :** A worm can be prevented by strong and various check points on communication system.
- 2) **Virus Prevention :**
 - (a) Users cannot cure the data after viral affection. Hence the best way is to prevent viruses.
 - (b) For this user must buy official, legal copies of software from reliable stores or sources.
 - (c) One should be extremely careful about picking up free unreliable or illegal software.
 - (d) Frequent back-ups and running of monitoring programs also help in detection, and thus subsequent prevention of different viruses.

Q. 75 Select the correct alternative and rewrite the following.

1. Operating system is ————— **(March 2003, Oct. 2002)**
- 1) hardware 2) software 3) input device 4) output device

Ans. : (2) Software

2. ————— is service in operating system.

- 1) Information management 2) Process
- 3) G.U.I. 4) None of these

Ans. : (1) Information management

3. Windows NT is ————— operating system.

- 1) Single user multitasking 2) Multiuser multitasking
- 3) Time sharing 4) None of these

Ans. : (2) Multiuser multitasking

4. Linux is a ————— software. **(March 2012, March 2020)**
- 1) public domain 2) free 3) paid 4) private

Ans. : (2) free

5. Windows 98 is ————— operating system.

- 1) single user multitasking 2) Multiuser
- 3) Time sharing 4) Multithreading

Ans. : (1) single user multitasking

6. The time required for read-write head to move to the correct track is ————— **(March 2009; Oct. 2021)**

- 1) Seek time 2) Rotational delay
- 3) Latency time 4) None of these

Ans. : (1) Seek time

7. Termination of a process is done by —

- 1) Memory management
- 2) Process management
- 3) Device driver
- 4) Information management

Ans. : (2) Process management

8. The time lost in turning the attention of processor from one process to other is called as _____. (March 2017)

- 1) Circuit switching
- 2) Band width
- 3) Context switching
- 4) None of these

Ans. : (3) Context switching

9. — is a function of memory management.

- 1) Creation of file
- 2) Halting process
- 3) Paging
- 4) None of these

Ans. : (3) Paging

10. If the page size for 2 MB memory is 2 kB, then the number of higher order bits on address bus, used to denote page number is _____. (March 2002, March 2018)

- 1) 11
- 2) 10
- 3) 9
- 4) 8

Ans. : (2) 10

11. Wastage of memory space within the partition is called as —

- 1) Internal fragmentation
- 2) External fragmentation
- 3) Compaction
- 4) None of these

Ans. : (1) Internal fragmentation

12. If a page is modified after it is loaded in main memory, then it is called as —

- 1) Page fault
- 2) Dirty page
- 3) Paging
- 4) Locality of reference

Ans. : (2) Dirty page

13. Pages are physical in nature, while segments are —

- 1) logical
- 2) virtual
- 3) either physical or logical
- 4) either virtual or physical

Ans. : (1) logical

14. Following is not a process state —

- 1) ready
- 2) blocked
- 3) resumed
- 4) running

Ans. : (3) resumed

15. Windows NT is — operating system. (Oct. 2003)

- 1) Multiuser
- 2) Multitasking
- 3) Multithreading
- 4) All of the above

Ans. : (4) All of the above

16. — is not an operating system. (March. 2004, 14)

- 1) UNIX
- 2) LINUX
- 3) MS-DOS
- 4) C++

Ans. : (4) C++

17. — spread more rapidly but causes less damage to computer networks. (Oct. 2004)

- 1) Virus
- 2) Worms
- 3) Bombs
- 4) None of these

Ans. : (2) Worms

18. — are the operating system programs. (March 2005, July 17)

- 1) Application program
- 2) User program
- 3) Process management program
- 4) Antivirus program

Ans. : (3) Process management program

19. _____ is given to each process so that a process does not use the CPU indefinitely. (Oct. 2005)
- 1) Context Switching
 - 2) Time Slice
 - 3) Token Time
 - 4) Purchased Priority
- Ans. : (2) Time Slice
20. In Information Management _____ service is provided by operating system. (Oct. 2006)
- 1) Change the priority of process
 - 2) To allocate a chunk of memory to process
 - 3) Open a file (for read, write or both)
 - 4) Wait for a child process to terminate
- Ans. : (3) Open a file (for read, write or both)
21. _____ is an operating system. (March 2007)
- (i) C++
 - (ii) C
 - (iii) VB
 - (iv) LINUX
- Ans. : (iv) LINUX
22. Scheduling Policy is the term related to _____ Management of O.S. (Oct. 2007)
- i) Information
 - ii) Process
 - iii) Device
 - iv) Memory
- Ans. : (ii) Process
23. Terminate a Process is the system call available in _____ management. (March 2008; July 2019)
- i) Process
 - ii) Memory
 - iii) Information
 - iv) File
- Ans. : (i) Process
24. _____ program is a part of operating system. (Oct. 2008)
- (i) Application
 - (ii) Antivirus
 - (iii) Process Management
 - (iv) User's
- Ans. : (iii) Process Management
25. Data is instantly updated, in case of _____ Operating System. (March 2010)
- (i) Batch Processing
 - (ii) Multi Programming
 - (iii) Multi User
 - (iv) Real Time.
- Ans. : (iv) Real Time
26. _____ are not operating system programs. (Oct. 2010)
- i) Process Management Programs
 - ii) Information Management Programs
 - iii) Memory Management Programs
 - iv) Anti -Virus Programs
- Ans. : (iv) Anti -Virus Programs
27. A program under execution, which competes for the CPU time and other resources is called _____. (March 2011)
- i) Process
 - ii) Multi-programming
 - iii) Context Switching
 - iv) None of these
- Ans. : (i) Process
28. If the page size for 1 MB is 2 KB then the number of higher order bit of the address bus used to denote the page number is _____. (Oct. 2011)
- (i) 11
 - (ii) 10
 - (iii) 9
 - (iv) 8
- Ans. : (iii) 9
29. 'Terminate a Process' is System call in _____. (Oct. 2012)
- (i) Information Management
 - (ii) Process Management
 - (iii) Memory Management
 - (iv) None of these
- Ans. : (ii) Process Management
30. If the page size of 1 MB Memory is 1 KB, then the number of higher order bits of the address bus used to denote page number is _____. (March 2013)
- (i) 10
 - (ii) 11
 - (iii) 12
 - (iv) 9
- Ans. : (i) 10

31. If the page of 4MB Memory is 1KB, then the number of higher order bits of the address bus used for page number is _____. (Oct. 2013)

- (i) 11
- (ii) 21
- (iii) 12
- (iv) 22

Ans. : (iii) 12

32. _____ is a free software. (Oct. 2014, March 2019)

- (i) UNIX
- (ii) DOS
- (iii) LINUX
- (iv) WINDOWS

Ans. : (iii) LINUX

33. The time required to move R/W head to the particular track is called _____. (March 2015)

- (i) Latency time
- (ii) Seek time
- (iii) Waiting time
- (iv) Response time

Ans. : (ii) Seek time

34. _____ is not a process state in OS. (Oct. 2015)

- (i) Ready
- (ii) Running
- (iii) Exited
- (iv) Blocked

Ans. : (iii) Exited

35. _____ is an Operating System. (March 2016)

- (i) VBSCRIPT
- (ii) UNIX
- (iii) C
- (iv) BASIC

Ans. : (ii) UNIX

36. Context Switching is a term related to _____ Management. (March 2016)

- (i) Process
- (ii) Memory
- (iii) Information
- (iv) Device

Ans. : (i) Process

37. In memory management system, where the part of the process image is in the main memory and the other part is on the disk, is known as _____. (July 2016)

- (i) Segmented Memory Management System
- (ii) Single Contiguous Memory Management System
- (iii) Virtual Memory Management System
- (iv) Combined Memory Management System

Ans. : (iii) Virtual Memory Management System

38. Turning attention of CPU from one process to another is called _____. (July 2018)

- (i) reference
- (ii) Context switch
- (iii) Process scheduling
- (iv) Multiprogramming

Ans. : (ii) Context switch

Q. 39 _____ is the only operating system from the following list. (March 2022)

- (i) MS Point
- (ii) Unix
- (iii) MS Excel
- (iv) Oracle

Ans. : (ii) Unix

Q. 40 _____ is oldest secondary storage medium. (Dec. 2020)

- (i) Hard Disk
- (ii) Magnetic Tape
- (iii) CD-ROM
- (iv) Floppy Disk

Ans. : (ii) Magnetic Tape

