GOVERNMENT ARTS AND SCIENCE COLLEGE
PERAVURANI-614804

16SCCCS6- OPERATING SYSTEMS

Unit wise – Two Marks Questions & Answers

DEPARTMENT OF COMPUTER SCIENCE

Class: III B.Sc., Computer Science

S.No	Topic
1	Introduction to Operating Systems
2	Memory Management
3	Processor Management
4	Device Management
5	File Management

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1 Introduction to Operating Systems

1. What is an Operating system?

An operating system is a program that manages the computer hardware. It also provides a basis for application programs and act as an intermediary between a user of a computer and the computer hardware. It controls and coordinates the use of the hardware among the various application programs for the various users.

2. What is the Kernel?

A more common definition is that the OS is the one program running at all times on the computer, usually called the kernel, with all else being application programs.

3. What is meant by Mainframe Systems?

Mainframe systems are the first computers developed to tackle many commercial and scientific applications. These systems are developed from the batch systems and then multiprogramming system and finally time sharing systems.

4. List the services provided by an Operating System?

- Program execution
- I/O Operation
- File-System manipulation
- Communications
- Error detection

5. What is meant by Multiprogramming?

Several users simultaneously compete for system resources (i.e) the job currently waiting for I/O will yield the CPU to another job which is ready to do calculations, if another job is waiting. Thus it increases CPU utilization and system throughput.

6. What is meant by Batch Systems?

Operators batched together jobs with similar needs and ran through the computer as a group. The operators would sort programs into batches with similar requirements and as system become available, it would run each batch.

7. What is meant by Time-sharing Systems?

Time Sharing is a logical extension of multiprogramming .Here, CPU executes multiple jobs by switching among them, but the switches occur so frequently that the users can interact with each program while it is running.

8. What are the Components of a Computer System?

- Application Programs
- System Program
- Operating System
- Computer Hardware

9. What are the advantages of Multiprogramming?

- Increased System Throughput
- Increased CPU utilization

10. What is Multiprocessor System?

Multiprocessor systems have systems more than one processor for communication, sharing the computer bus, the memory, clock & peripheral devices.

11. What are the advantages of multiprocessors?

- Increased throughput
- Economy of scale
- Increased reliability

12. What are Multiprocessor Systems & give their advantages?

Multiprocessor systems also known as parallel systems or tightly coupled systems are systems that have more than one processor in close communication, sharing the computer bus, the clock and sometimes memory & peripheral devices. Their main advantages are,

- Increased throughput
- Economy of scale
- Increased reliability

13. What are the different types of Multiprocessing?

Symmetric multiprocessing (SMP): In SMP each processor runs an identical copy of the OS & these copies communicate with one another as needed. All processors are peers. Examples are Windows NT, Solaris, Digital UNIX, and OS/2 & Linux.

***Asymmetric multiprocessing*:** Each processor is assigned a specific task. A master processor controls the system; the other processors look to the master for instructions or predefined tasks. It defines a master-slave relationship. Example: SunOS Version 4.

14. What is meant by clustered system?

Clustered systems are collection of multiple CPUs to accomplish computational work. Those systems share storage and are closely linked via LAN networking.

15. What are the types of clustering?

- Asymmetric Clustering
- Symmetric Clustering & Clustering over a WAN

16. What is meant by Asymmetric Clustering?

In this clustering, one machine is in hot standby mode, while the other is running the application. The hot standby machine just monitors the active server. If that server fails, hot standby host become the active server.

17. What is meant by Symmetric clustering?

Two or more hosts are running applications and they are monitoring each other. This clustering requires more than one application be available to run and it uses all of the available hardware.

18. What is meant by parallel clusters?

Parallel clusters allow multiple hosts to access the same data on the shared storage. Each machine has full access to all data in the database.

19. What is meant by Real time system?

Real time systems are systems that have their in-built characteristics as supplying immediate response. In real time system, each process is assigned a certain level of priority according to the relative importance of the events to be processed.

20. What are the advantages of distributed systems?

- Resource sharing
- Load balancing
- Reliability
- Communication link easy

21. What are the applications of real-time systems?

- Controlling the machines
- Instruments
- Industrial process
- Landing & tasking off aero planes
- Real time simulations
- Military applications.

22. What are the types of Real time systems?

- Hard Real Time System
- Soft Real Time System

23. What is meant by Hard Real time systems?

They are generally required to and they guarantee that the critical tasks are completed in given amount of time.

24. What is meant by soft real time system?

It provides priority to the tasks based on their criticality. It does not guarantee completion of critical tasks in time.

25. What is meant by distributed systems?

A distributed system is basically a collection of autonomous computer systems which cooperate with one another through their h/w and s/w interconnections.

26. What are the disadvantages of distributed systems?

- Security weakness
- Over dependence on performance and reliability
- Maintenance and control become complex

27. What are the modes of operation in Hardware Protection?

- User Mode
- Monitor Mode

28. What are Operating Services?

Normally, an operating system provides certain services to programs and to the users of those programs.

Some of them are:

- Program Execution.
- I/O operations
- File-system manipulation
- Communications
- Error Detection

29. What is System Programs?

System programs provide a convenient environment for program development and execution. Some of these programs are user interfaces to system calls and others are more complex.

Some of them are:

- File Management
- Status Information
- File modification
- Programming Language support Program loading,
- Execution and communication.

30. What are System Calls?

System calls provide the interface between a process and the Operating system. System Calls are also called as Monitor call or Operating-system function call. When a system call is executed, it is treated as by the hardware as software interrupt. Control passes through the interrupt vector to a service routine in the operating system, and the mode bit is set to monitor mode.

31. What are the five major categories of System Calls?

- Process Control
- File-management
- Device-management
- Information maintenance
- Communications

32. What is the use of Fork and Exec System Calls?

Fork is a System calls by which a new process is created. Exec is also a System call, which is used after a fork by one of the two processes to replace the process memory space with a new program.

Unit- 2	Memory Management

1. Define Dynamic Loading.

To obtain better memory-space utilization dynamic loading is used. With dynamic loading, a routine is not loaded until it is called. All routines are kept on disk in a reloadable load format. The main program is loaded into memory and executed. If the routine needs another routine, the calling routine checks whether the routine has been loaded. If not, the reloadable linking loader is called to load the desired program into memory.

2. Define Dynamic Linking.

Dynamic linking is similar to dynamic loading, rather that loading being postponed until execution time, linking is postponed. This feature is usually used with system libraries, such as language subroutine libraries. A stub is included in the image for each library-routine reference. The stub is a small piece of code that indicates how to locate the appropriate memory-resident library routine, or how to load the library if the routine is not already present.

3. What are Overlays?

To enable a process to be larger than the amount of memory allocated to it, overlays are used. The idea of overlays is to keep in memory only those instructions and data that are needed at a given time. When other instructions are needed, they are loaded into space occupied previously by instructions that are no longer needed.

4. Define Swapping.

A process needs to be in memory to be executed. However a process can be swapped temporarily out of memory to a backing store and then brought back into memory for continued execution. This process is called swapping.

5. What do you mean by Best Fit?

Best fit allocates the smallest hole that is big enough. The entire list has to be searched, unless it is sorted by size. This strategy produces the smallest leftover hole.

6. What do you mean by First Fit?

First fit allocates the first hole that is big enough. Searching can either start at the beginning of the set of holes or where the previous first-fit search ended. Searching can be stopped as soon as a free hole that is big enough is found.

7. How is memory protected in a paged environment?

Protection bits that are associated with each frame accomplish memory protection in a paged environment. The protection bits can be checked to verify that no writes are being made to a read-only page.

8. What is External Fragmentation?

External fragmentation exists when enough total memory space exists to satisfy a request, but it is not contiguous; storage is fragmented into a large number of small holes.

9. What is Internal Fragmentation?

When the allocated memory may be slightly larger than the requested memory, the difference between these two numbers is internal fragmentation.

10. What do you mean by Compaction?

Compaction is a solution to external fragmentation. The memory contents are shuffled to place all free memory together in one large block. It is possible only i f relocation is dynamic, and is done at execution time.

11. What are Pages and Frames?

Paging is a memory management scheme that permits the physical -address space of a process to be non-contiguous. In the case of paging, physical memory is broken into fixed-sized blocks called frames and logical memory is broken into blocks of the same size called pages.

12. What is the use of Valid-Invalid Bits in Paging?

When the bit is set to valid, this value indicates that the associated page is in the process's logical address space, and is thus a legal page. If the bit is said to invalid, this value indicates that the page is not in the process's logical address space. Using the valid-invalid bit traps illegal addresses.

13. What is the basic method of Segmentation?

Segmentation is a memory management scheme that supports the user view of memory. A logical address space is a collection of segments. The logical address consists of segment number and offset. If the offset is legal, it is added to the segment base to produce the address in physical memory of the desired byte.

14. What is Virtual Memory?

Virtual memory is a technique that allows the execution of processes that may not be completely in memory. It is the separation of user logical memory from physical memory. This separation provides an extremely large virtual memory, when only a smaller physical memory is available.

15. What is Demand Paging?

Virtual memory is commonly implemented by demand paging. In demand paging, the pager brings only those necessary pages into memory instead of swapping in a whole process. Thus it avoids reading into memory pages that will not be used anyway, decreasing the swap time and the amount of physical memory needed.

16. Define Lazy Swapper.

Rather than swapping the entire process into main memory, a lazy swapper is used. A lazy swapper never swaps a page into memory unless that page will be needed.

17. What is a Pure Demand Paging?

When starting execution of a process with no pages in memory, the operating system sets the instruction pointer to the first instruction of the process, which is on a non-memory resident page, the process immediately faults for the page. After this page is brought into memory, the process continues to execute, faulting as necessary until every page that it needs is in memory. At that point, it can execute with no more faults. This schema is pure demand paging.

18. Define Secondary Memory.

This memory holds those pages that are not present in main memory. The secondary memory is usually a high speed disk. It is known as the swap device, and the section of the disk used for this purpose is known as swap space.

19. What is the basic approach of Page Replacement?

If no frame is free is available, find one that is not currently being used and free it. A frame can be freed by writing its contents to swap space, and changing the page table to indicate that the page is no longer in memory. Now the freed frame can be used to hold the page for which the process faulted.

20. What is the various Page Replacement Algorithms used for Page Replacement?

- FIFO page replacement
- Optimal page replacement
- LRU page replacement
- LRU approximation page replacement
- Counting based page replacement
- Page buffering algorithm.

21. What are the major problems to implement Demand Paging?

The two major problems to implement demand paging is developing,

- Frame allocation algorithm
- Page replacement algorithm

22. What is a Reference String?

An algorithm is evaluated by running it on a particular string of memory references and computing the number of page faults. The string of memory reference is called a reference string.

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24. Define secondary memory.

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25. List out the activities for memory management.

- Keeps tracks of primary memory, i.e., what part of it are in use by whom, what part is not in use?
- In multiprogramming, the OS decides which process will get memory when and how much.
- Allocates the memory when a process requests it to do so.
- De-allocates the memory when a process no longer needs it or has been terminated.

26. Define Cache Memory.

The Cache Memory is the Memory which is very nearest to the CPU , all the Recent Instructions are Stored into the Cache Memory.

Unit- 3	Processor Management

1. Define process?

A process is more than a program code, which is sometime known as the text section. IT also includes the current activity, as represented by the value of the program counter and the processor's registers.

2. What is meant by the state of the process?

The state of the process is defined in part by the current activity of that process. Each process may be in one of the following states.

- New: The process is being created.
- Running: Instruction are being executed
- Waiting: The process is waiting for some event to occur.
- Ready: The process is waiting to be assigned to a processor
- Terminated: The process has finished execution

3. Define process control block contain?

Each process is represented in the operating system by a process control block (PCB) also called as task control block. The PCB simply serves as the repository for any information that may vary from process to process.

4. What does PCB contain?

- Process state
- Program counter
- CPU registers
- CPU scheduling information
- Memory management information
- Accounting information

5. What are the 3 different types of scheduling queues?

- Job Queue: As process enters the system they are put into job queue.
- Ready Queue: The processes that are residing in the main memory and are ready and waiting to execute are kept in the queue
- Device Queue: The list of processes waiting for particular I/O device is called a device queue.

6. Define schedulers?

A process migrates between the various scheduling throughout its lifetime. The operating system must select, for scheduling purposes, processes from these queues in some fashion. The selection process is carried out by the appropriate scheduler.

7. What are the types of scheduler?

Long term scheduler or job scheduler selects processes from the pool and load them into the memory for execution. Short term scheduler or CPU scheduler, select among the processes that are ready to execute and allocates the CPU to one of them.

8. Define critical section?

If a system consist on n processes {P0, P1,……., Pn-1}.Each process has a segment of code called a critical section, in which the process may be changing common variables, updating a table, writing a file. The important feature of this system is that, when one process is in its critical section, no other process is to be allowed to execute in its critical section.

9. What requirement is to be satisfied for a solution of a critical section problem?

A solution to the critical section problem must satisfy the following 3 requirements.

- Mutual exclusion: If process P1 is executing in its critical section, then no other processes can be executing in their critical sections.
- Progress: If no process is executing in its critical section and some processes wish to enter their critical sections, then only those processes that are not executing in their remainder section can participate in the decision on which will enter its critical section next, and this selection cannot be postponed indefinitely.
- Bounded waiting: There exists a bound on the number of times that other processes are allowed to enter their critical section after a process has made a request to enter its critical section and before that request is granted.

10. Define semaphores.

Semaphore is a synchronization toll. A semaphore S is an integer variable that apart from initialization is accessed only through 2 standard atomic operations.

- Wait
- Signal

11. Define Starvation in deadlock?

A problem related to deadlock is indefinite blocking or starvation, a situation where processes wait indefinitely within a semaphore. Indefinite blocking may occur if we add and remove processes from the list associated with a semaphore in LIFO order.

12. Name dome classic problem of synchronization?

- The Bounded – Buffer Problem
- The Reader – Writer Problem
- The Dining –Philosophers Problem

13. Define deadlock?

A process request resources; if the resource are not available at that time, the process enters a wait state. Waiting processes may never change state, because the resources they are requested are held by other waiting processes. This situation is called deadlock.

14. What is the sequence of operation by which a process utilizes a resource?

Under the normal mode of operation, a process may utilize a resource in only the following sequence:

- Request: If the request cannot be granted immediately, then the requesting process must wait until it can acquire the response.
- Use: The process can operate on the resource.
- Release: The process releases the resource

15. Give the condition necessary for a deadlock situation to arise?

A deadlock situation can arise if the following 4 condition hold simultaneously in a system.

- Mutual Exclusion
- Hold and Wait
- No preemption
- Circular Wait

16. Define 'Safe State"?

A state is safe if the system allocates resources to each process in some order and still avoid deadlock.

17. What is the use of cooperating processes?

- Information sharing: Since several users may be interested in the same piece of information, we must provide an environment to allow concurrent access to these type of resources.
- Computation speedup: If we want a particular task to run faster, we must break it into subtask, each of which executing in parallel with others.
- Modularity: We may want to construct the system in a modular fashion, dividing the system functions into separate processes or thread.
- Convenience: Even an individual user may have many tasks on which to work at one time. For instance a user is editing, printing and computing in parallel.

18. Define deadlock-avoidance algorithm?

A deadlock-avoidance algorithm dynamically examines the resource allocation state to ensure that a circular wait condition can never exist. The resource allocation state is defined by the number of available and allocated resources, and the maximum demand of the processes.

19. What are the benefits of multithreaded programming?

- Responsiveness
- Resource sharing
- Economy
- Utilization of multiprocessor architecture

20. Define deadlock detection diction?

If a system does not employ either a deadlock-prevention or a deadlock avoidance algorithm, then a deadlock situation may occur. In this environment, the system must provide:

- An algorithm that examines the state of the system to determine whether a deadlock has occurred
- An algorithm to recover from the deadlock.

21. Define race condition.

Several process access and manipulate same data concurrently, then the outcome of the execution depends on particular order in which the access takes place is called race condition. to avoid race condition, only one process at a time can manipulate the shared variable

22. What is critical section problem?

Consider a system consists of ‘n‘processes. Each process has segment of Code called a critical section, in which the process may be changing common variables, updating a table, writing a file. When one process is executing in its critical section, no other process can allowed to execute in its critical section.

23. Define busy waiting and spinlock.

When a process is in its critical section, any other process that tries to enter its critical section must loop continuously in the entry code. This is called as busy waiting and this type of semaphore is also called a spinlock, because the process while waiting for the lock.

24. What are the requirements that a solution to the critical section problem must satisfy?

The three requirements are

- Mutual Exclusion
- Progress
- Bounded waiting

25. Define entry section and exit section.

The critical section problem is to design a protocol that the processes can use to cooperate. Each process must request permission to enter its critical section. The section of the code implementing this request is the entry section. The critical section is followed by an exit section. The remaining code is the remainder section.

26. What are conditions under which a deadlock situation may arise?

A deadlock situation can arise if the following four conditions hold Simultaneously in a system:

a. Mutual exclusion
b. Hold and wait
c. No pre-emption
d. Circular wait

27. What is a resource-allocation graph?

Deadlocks can be described more precisely in terms of a directed graph called a system resource allocation graph. This graph consists of a set of vertices V and a set of edges E. The set of vertices V is partitioned into two different types of nodes; P the set consisting of all active processes in the system and R the set consisting of all resource types in the system.

Unit- 4 | Device Management

1. Define Device Management.

An Operating System manages device communication via their respective drivers.

2. What are the device management functions?

- Keeps tracks of all devices. Program responsible for this task is known as the **I/O controller**.
- Decides which process gets the device when and for how much time.
- Allocates the device in the efficient way.
- De-allocates devices

3. Define SAM.

Sequential access memory (SAM) is a class of data storage devices that read stored data in a sequence

4. Define Access control.

Access Control is the process of mediating the requests for accessing data in a system and determining whether the request should be granted or denied

5. What is meant by Seek Time?

It is the time taken for the disk arm to move the heads to the cylinder containing the desired sector.

6. What is meant by Rotational Latency?

It is defined as the additional time waiting for the disk to rotate the desired sector to the disk head.

7. What is meant by Band Width?

Band Width is the total number of bytes transferred, divided by the total time between the first request for service and the completion of the last transfer.

8. What is meant by Low-level formatting?

Low-level formatting fills the disk with a special data structure for each sector .The Data structure for a sector typically consists of a header ,a data area and a trailer.

9. What is meant by Swap-Space Management?

It is a low-level task of the operating system .Efficient management of the swap space is called as Swap space management. This Swap space is the space needed for the entire process image including code and Data segments.

10. What is meant by Disk Scheduling?

Disk scheduling is a process of allocation of the disk to one process at a time. In multi programmed system, many processes try to read or write the records on disks as the same time. To avoid disk arbitration, it is necessary.

11. Why Disk Scheduling necessary?

To avoid Disk arbitration which occurs when many processes try to read or write the records on disks at the same time, Disk Scheduling is necessary.

12. What are the characteristics of Disk Scheduling?

1) Throughput
2) Mean Response Time
3) Variance of Response time

13. What are the different types of Disk Scheduling?

Some of the Disk Scheduling are
(i).SSTF Scheduling
(ii).FCFS Scheduling
(iii) SCAN Scheduling
(iv).C-SCAN Scheduling
(v).LOOK Scheduling.

14. What is meant by SSTF Scheduling?.

SSTF Algorithm selects the request with the minimum seek time from the current head position. and SSTF chooses the pending request to the current head position.

15. What is meant by FCFS Scheduling ?

It is Simplest form of Disk Scheduling. This algorithm serves the first come process always and is does not provide Fast service.

16. What is meant by SCAN Scheduling ?.

In the SCAN algorithm, the disk arm starts at one end of the disk and moves toward the other end of the disk. At the other end, the direction of head movement is reversed and servicing continues across the disk.

17. What is meant by C-SCAN Scheduling?

C-SCAN means Circular SCAN algorithm. This Scheduling is a variant of SCAN designed to provide a more waiting time. This essentially treats the cylinder as a circular list that wraps around from the final cylinder to the first one.

18. Define Throughput.

It is defined as the number of requests serviced per unit time.

19. What is meant by Data Striping?

Data Stripping means splitting the bits of each byte across multiple disks .It is also called as Bit -level Striping.

20. What is meant by Boot Disk?

A Disk that has a boot partition is called as Boot Disk.

Unit- 5	File Management

1. What is a File?

A file is a named collection of related information that is recorded on secondary storage. A file contains either programs or data. A file has certain "structure" based on its type.

- File attributes: Name, identifier, type, size, location, protection, time, date
- File operations: creation, reading, writing, repositioning, deleting, truncating, appending, renaming
- File types: executable, object, library, source code etc.

2. List the various File Attributes.

A file has certain other attributes, which vary from one operating system to another, but typically consist of these: Name, identifier, type, location, size, protection, time, date and user identification.

3. What are the various File Operations?

The basic file operations are,

- Creating a file
- Writing a file
- Reading a file
- Repositioning within a file

- Deleting a file
- Truncating a file

4. What is the information associated with an Open File?

Several pieces of information are associated with an open file which may be:

- File pointer
- File open count
- Disk location of the file
- Access rights

5. What are the different Accessing Methods of a File?

The different types of accessing a file are:

- Sequential access: Information in the file is accessed sequentially
- Direct access: Information in the file can be accessed without any particular order.
- Other access methods: Creating index for the file, indexed sequential access method

6. What is Directory?

The device directory or simply known as directory records information- such as name, location, size, and type for all files on that particular partition. The directory can be viewed as a symbol table that translates file names into their directory entries.

7. What are the operations that can be performed on a Directory?

The operations that can be performed on a directory are,

- Search for a file
- Create a file
- Delete a file
- Rename a file
- List directory
- Traverse the file system

8. What are the most common schemes for defining the Logical Structure of a Directory?

The most common schemes for defining the logical structure of a directory

- Single-Level Directory
- Two-level Directory
- Tree-Structured Directories
- Acyclic-Graph Directories
- General Graph Directory

9. Define UFD and MFD.

In the two-level directory structure, each user has own user file directory Each UFD has a similar structure, but lists only the files of a single user. When a job starts the system‟s master file directory

10. What is a Path Name?

A pathname is the path from the root through all subdirectories to a specified file. In a two-level directory structure a user name and a file name define a path name.

11. What is Access Control List?

The most general scheme to implement identity-dependent access is to associate with each file and directory an access control unit.

12. Define Equal Allocation.

The way to split '*m'* frames among '*n'* processes is to give everyone an equal share, *m/n* frames. For instance, if there are 93 frames and 5 processes, each process will get 18 frames. The leftover 3 frames could be used as a free-frame buffer pool. This scheme is called equal allocation.

13. What is Belady's Anomaly?

For some page replacement algorithms, the page fault rate may increase as the number of allocated frames increases.

14. What are the types of Path Names?

Path names can be of two types.

- ***Absolute path name:*** Begins at the root and follows a path down to the specified file, giving the directory names on the path.
- ***Relative path name:*** Defines a path from the current directory.

15. What is meant by Locality of Reference?

The locality model states that, as a process executes, it moves from locality to locality. Locality is of two types.

- Spatial locality
- Temporal locality.

16. Define Seek Time and Latency Time.

The time taken by the head to move to the appropriate cylinder or track is called seek time. Once the head is at right track, it must wait until the desired block rotates under the read- write head. This delay is latency time.

17. What are the Allocation Methods of a Disk Space?

Three major methods of allocating disk space which are widely in use are

- Contiguous allocation
- Linked allocation
- Indexed allocation

18. What are the advantages of Contiguous Allocation?

The advantages are,

- Supports direct access
- Supports sequential access
- Number of disk seeks is minimal.

19. What are the drawbacks of Contiguous Allocation of Disk Space?

The disadvantages are,

- Suffers from external fragmentation
- Suffers from internal fragmentation
- Difficulty in finding space for a new file
- File cannot be extended
- Size of the file is to be declared in advance

20. What are the advantages of Linked Allocation?

The advantages are,

- No external fragmentation
- Size of the file does not need to be declared

21. What are the disadvantages of Linked Allocation?

The disadvantages are,

- Used only for sequential access of files.
- Direct access is not supported
- Memory space required for the pointers.
- Reliability is compromised if the pointers are lost or damaged

22. What are the various Disk-Scheduling Algorithms?

The various disk-scheduling algorithms are,

- First Come First Served Scheduling
- Shortest Seek Time First Scheduling
- SCAN Scheduling
- C-SCAN Scheduling
- LOOK scheduling

23. What are the techniques used for performing I/O.

- Programmed I/O
- Interrupt driven I/O
- Direct Memory Access

24. Give an example of an application in which data in a file should be accessed in the following order:

- ***Sequentially*** **-** Print the content of the file.
- ***Randomly*** - Print the content of record *i*. This record can be found using hashing or index techniques

25. Discuss in detail File operations.

Creating a file; Writing a file; Reading a file;
Repositioning within a file;
Deleting a file; Truncation a file;
Other Operations: - Append; Rename; Copy and Set Various other Attributes.