1) What is an operating system?

The operating system is a software program that facilitates computer hardware to communicate and operate with the computer software. It is the most important part of a computer system without it computer is just like a box.

2) What is the main purpose of an operating system?

There are two main purposes of an operating system:

- It is designed to make sure that a computer system performs well by managing its computational activities.
- It provides an environment for the development and execution of programs.

3) What are the different operating systems?

- Batched operating systems
- Distributed operating systems
- Timesharing operating systems
- Multi-programmed operating systems
- Real-time operating systems

4) What is a socket?

A socket is used to make connection between two applications. Endpoints of the connection are called socket.

5) What is a real-time system?

A **Real time operating system** handles some tasks or routines to be **run**. The kernel of the **operating system** assigns CPU attention to a particular task for a period of **time**. It also checks the task priority, arranges the massages from tasks and schedules.

6) What is kernel?

A **Kernel** is a computer program that is the heart and core of an **Operating System**. Since the **Operating System** has control over the system so, the **Kernel** also has control over everything in the system. ...
The **Kernel** is responsible for low-level tasks such as disk management, memory management, task management, etc.

8) What do you mean by a process?

An executing program is known as process. There are two types of processes:

- Operating System Processes
- User Processes

9) What are the different states of a process?

A list of different states of process:

- New Process
- Running Process

- Waiting Process
- Ready Process
- Terminated Process

10) What is the difference between micro kernel and macro kernel?

Micro kernel: micro kernel is the kernel which runs minimal performance affecting services for operating system. In micro kernel operating system all other operations are performed by processor.

Macro Kernel: Macro Kernel is a combination of micro and monolithic kernel.

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11) What is the concept of reentrancy?

It is a very useful memory saving technique that is used for multi-programmed time sharing systems. It provides functionality that multiple users can share a single copy of program during the same period.

It has two key aspects:

- The program code cannot modify itself.
- The local data for each user process must be stored separately.

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12) What is the difference between process and program?

A program while running or executing is known as a process.

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13) What is the use of paging in operating system?

Paging is used to solve the external fragmentation problem in operating system. This technique ensures that the data you need is available as quickly as possible.

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14) What is the concept of demand paging?

Demand paging specifies that if an area of memory is not currently being used, it is swapped to disk to make room for an application's need.

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15) What is the advantage of a multiprocessor system?

As many as processors are increased, you will get the considerable increment in throughput. It is cost effective also because they can share resources. So, the overall reliability increases.

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16) What is virtual memory?

Virtual memory is a very useful memory management technique which enables processes to execute outside of memory. This technique is especially used when an executing program cannot fit in the physical memory.

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17) What is thrashing?

Thrashing is a phenomenon in virtual memory scheme when the processor spends most of its time in swapping pages, rather than executing instructions.

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18) What are the four necessary and sufficient conditions behind the deadlock?

These are the 4 conditions:

1) **Mutual Exclusion Condition**: It specifies that the resources involved are non-sharable.

2) **Hold and Wait Condition**: It specifies that there must be a process that is holding a resource already allocated to it while waiting for additional resource that are currently being held by other processes.

3) **No-Preemptive Condition**: Resources cannot be taken away while they are being used by processes.

4) **Circular Wait Condition**: It is an explanation of the second condition. It specifies that the processes in the system form a circular list or a chain where each process in the chain is waiting for a resource held by next process in the chain.

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19) What is a thread?

A thread is a basic unit of CPU utilization. It consists of a thread ID, program counter, register set and a stack.

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20) What is FCFS?

FCFS stands for First Come, First Served. It is a type of scheduling algorithm. In this scheme, if a process requests the CPU first, it is allocated to the CPU first. Its implementation is managed by a FIFO queue.

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21) What is SMP?

SMP stands for Symmetric MultiProcessing. It is the most common type of multiple processor system. In SMP, each processor runs an identical copy of the operating system, and these copies communicate with one another when required.

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22) What is RAID? What are the different RAID levels?

RAID stands for Redundant Array of Independent Disks. It is used to store the same data redundantly to improve the overall performance.

Following are the different RAID levels:

RAID 0 - Stripped Disk Array without fault tolerance

RAID 1 - Mirroring and duplexing

RAID 2 - Memory-style error-correcting codes

RAID 3 - Bit-interleaved Parity

RAID 4 - Block-interleaved Parity

RAID 5 - Block-interleaved distributed Parity

RAID 6 - P+Q Redundancy

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23) What is deadlock? Explain.

Deadlock is a specific situation or condition where two processes are waiting for each other to complete so that they can start. But this situation causes hang for both of them.

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24) Which are the necessary conditions to achieve a deadlock?

There are 4 necessary conditions to achieve a deadlock:

- **Mutual Exclusion:** At least one resource must be held in a non-sharable mode. If any other process requests this resource, then that process must wait for the resource to be released.
- **Hold and Wait:** A process must be simultaneously holding at least one resource and waiting for at least one resource that is currently being held by some other process.
- **No preemption:** Once a process is holding a resource (i.e. once its request has been granted), then that resource cannot be taken away from that process until the process voluntarily releases it.
- **Circular Wait:** A set of processes { P0, P1, P2, . . ., PN } must exist such that every P[i] is waiting for P[(i + 1) % (N + 1)].

Note: This condition implies the hold-and-wait condition, but it is easier to deal with the conditions if the four are considered separately.

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25) What is Banker's algorithm?

Banker's algorithm is used to avoid deadlock. It is the one of deadlock-avoidance method. It is named as Banker's algorithm on the banking system where bank never allocates available cash in such a manner that it can no longer satisfy the requirements of all of its customers.

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26) What is the difference between logical address space and physical address space?

Logical address space specifies the address that is generated by CPU. On the other hand physical address space specifies the address that is seen by the memory unit.

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27) What is fragmentation?

Fragmentation is a phenomenon of memory wastage. It reduces the capacity and performance because space is used inefficiently.

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28) How many types of fragmentation occur in Operating System?

There are two types of fragmentation:

- **Internal fragmentation**: It is occurred when we deal with the systems that have fixed size allocation units.
- **External fragmentation**: It is occurred when we deal with systems that have variable-size allocation units.

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29) What is spooling?

Spooling is a process in which data is temporarily gathered to be used and executed by a device, program or the system. It is associated with printing. When different applications send output to the printer at the same time, spooling keeps these all jobs into a disk file and queues them accordingly to the printer.

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30) What is the difference between internal commands and external commands?

Internal commands are the built-in part of the operating system while external commands are the separate file programs that are stored in a separate folder or directory.

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31) What is semaphore?

Semaphore is a protected variable or abstract data type that is used to lock the resource being used. The value of the semaphore indicates the status of a common resource.

There are two types of semaphore:

- Binary semaphores
- Counting semaphores

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32) What is a binary Semaphore?

Binary semaphore takes only 0 and 1 as value and used to implement mutual exclusion and synchronize concurrent processes.

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33) What is Belady's Anomaly?

Belady's Anomaly is also called FIFO anomaly. Usually, on increasing the number of frames allocated to a process virtual memory, the process execution is faster, because fewer page faults occur. Sometimes, the reverse happens, i.e., the execution time increases even when more frames are allocated to the process. This is Belady's Anomaly. This is true for certain page reference patterns.

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34) What is starvation in Operating System?

Starvation is Resource management problem. In this problem, a waiting process does not get the resources it needs for a long time because the resources are being allocated to other processes.

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35) What is aging in Operating System?

Aging is a technique used to avoid the starvation in resource scheduling system.

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36) What are the advantages of multithreaded programming?

A list of advantages of multithreaded programming:

- Enhance the responsiveness to the users.
- Resource sharing within the process.
- Economical
- Completely utilize the multiprocessing architecture.

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37) What is the difference between logical and physical address space?

Logical address specifies the address which is generated by the CPU whereas physical address specifies to the address which is seen by the memory unit.

After fragmentation

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38) What are overlays?

Overlays makes a process to be larger than the amount of memory allocated to it. It ensures that only important instructions and data at any given time are kept in memory.

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39) When does trashing occur?

Thrashing specifies an instance of high paging activity. This happens when it is spending more time paging instead of executing.

3) What are the advantages of a multiprocessor system?

With an increased number of processors, there is a considerable increase in throughput. It can also save more money because they can share resources. Finally, overall reliability is increased as well.

5) What are real-time systems?

Real-time systems are used when rigid time requirements have been placed on the operation of a processor. It has well defined and fixed time constraints.

7) Describe the objective of multiprogramming.

The main objective of multiprogramming is to have a process running at all times. With this design, CPU utilization is said to be maximized.

8) What is time- sharing system?

In a Time-sharing system, the CPU executes multiple jobs by switching among them, also known as multitasking. This process happens so fast that users can interact with each program while it is running.

9) What is SMP?

SMP is a short form of Symmetric Multi-Processing. It is the most common type of multiple-processor systems. In this system, each processor runs an identical copy of the operating system, and these copies communicate with one another as needed.

10) How are server systems classified?

Server systems can be classified as either computer-server systems or file server systems. In the first case, an interface is made available for clients to send requests to perform an action. In the second case, provisions are available for clients to create, access and update files.

11) What is asymmetric clustering?

In asymmetric clustering, a machine is in a state known as hot standby mode where it does nothing but to monitor the active server. That machine takes the active server's role should the server fails.

What is RR scheduling algorithm?

RR (round-robin) scheduling algorithm is primarily aimed for time-sharing systems. A circular queue is a setup in such a way that the CPU scheduler goes around that queue, allocating CPU to each process for a time interval of up to around 10 to 100 milliseconds.

16) What are necessary conditions which can lead to a deadlock situation in a system?

Deadlock situations occur when four conditions occur simultaneously in a system: Mutual exclusion; Hold and Wait; No preemption; and Circular wait.

What is Direct Access Method?

Direct Access method is based on a disk model of a file, such that it is viewed as a numbered sequence of blocks or records. It allows arbitrary blocks to be read or written. Direct access is advantageous when accessing large amounts of information.

29) When does thrashing occur?

Thrashing refers to an instance of high paging activity. This happens when it is spending more time paging instead of executing.

30) What is the best page size when designing an operating system?

The best paging size varies from system to system, so there is no single best when it comes to page size. There are different factors to consider in order to come up with a suitable page size, such as page table, paging time, and its effect on the overall efficiency of the operating system.

31) When designing the file structure for an operating system, what attributes are considered?

Typically, the different attributes for a file structure are naming, identifier, supported file types, and location for the files, size, and level of protection.

32) What is root partition?

Root partition is where the operating system kernel is located. It also contains other potentially important system files that are mounted during boot time.

33) What are device drivers?

Device drivers provide a standard means of representing I/O devices that maybe manufactured by different companies. This prevents conflicts whenever such devices are incorporated in a systems unit.

34) What are the primary functions of VFS?

VFS, or Virtual File System, separate file system generic operations from their implementation by defining a clean VFS interface. It is based on a file-representation structure known as vnode, which contains a numerical designator needed to support network file systems.

35) What are the different types of CPU registers in a typical operating system design?

– Accumulators
– Index Registers
– Stack Pointer
– General Purpose Registers

36) What is the purpose of an I/O status information?

I/O status information provides information about which I/O devices are to be allocated for a particular process. It also shows which files are opened, and other I/O device state.

What is an Assembler?

An assembler acts as a translator for low-level language. Assembly codes written using mnemonic commands are translated by the Assembler into machine language.

42) What are interrupts?

Interrupts are part of a hardware mechanism that sends a notification to the CPU when it wants to gain access to a particular resource. An interrupt handler receives this interrupt signal and “tells” the processor to take action based on the interrupt request.

43) What is GUI?

GUI is short for Graphical User Interface. It provides users with an interface wherein actions can be performed by interacting with icons and graphical symbols. People find it easier to interact with the computer when in a GUI especially when using the mouse. Instead of having to remember and type commands, users click on buttons to perform a process.

44) What is preemptive multitasking?

Preemptive multitasking allows an operating system to switch between software programs. This, in turn, allows multiple programs to run without necessarily taking complete control over the processor and resulting in system crashes.

45) Why partitioning and formatting is a prerequisite to installing an operating system?

Partitioning and formatting create a preparatory environment on the drive so that the operating system can be copied and installed properly. This includes allocating space on the drive, designating a drive name, determining and creating the appropriate file system and structure.

46) What is plumbing/piping?

It is the process of using the output of one program as an input to another. For example, instead of sending the listing of a folder or drive to the main screen, it can be piped and sent to a file, or sent to the printer to produce a hard copy.

47) What is NOS?

NOS is short for Network Operating System. It is a specialized software that will allow a computer to communicate with other devices over the network, including file/folder sharing.

48) Differentiate internal commands from external commands.

Internal commands are built-in commands that are already part of the operating system. External commands are separate file programs that are stored in a separate folder or directory.