TatyaVinchu s'

System Programing Operating System

Viva Questions

A list of top frequently asked SPOS viva questions and answers are given below.

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?

Real-time system is used in the case when rigid-time requirements have been placed on the operation of a processor. It contains a well defined and fixed time constraints.

6) What is kernel?

Kernel is the core and most important part of a computer operating system which provides basic services for all parts of the OS.

7) What is monolithic kernel?

A monolithic kernel is a kernel which includes all operating system code is in single executable image.

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.

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.

12) What is the difference between process and program?

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

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.

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.

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.

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.

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.

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.

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.

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.

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.

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

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.

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.

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.

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.

27) What is fragmentation?

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

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.

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.

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.

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

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.

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.

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.

35) What is aging in Operating System?

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

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.

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

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.

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.

Basic OS Interview Questions

1. Why is the operating system important?

OS is the most essential and vital part of a computer without which it is considered useless. It enables an interface or acts like a link for interaction between computer software that is installed on OS and users. It also helps to communicate with hardware and also maintains balance among hardware and CPU. It also provides services to users and a platform for programs to run on. It performs all common tasks applications require.

2. What's the main purpose of an OS? What are the different types of OS?

The main purpose of an OS is to execute user programs and make it easier for users to understand and interact with computers as well as run applications. It is specially designed to ensure that the computer system performs better by managing all computational activities. It also manages computer memory, processes, and operation of all hardware and software.

Types of OS:

Batched OS (Example: Payroll System, Transactions Process, etc.)

Multi-Programmed OS (Example: Windows O/S, UNIX O/S, etc.)

Timesharing OS (Example: Multics, etc.)

Distributed OS (LOCUS, etc.)

Real-Time OS (PSOS, VRTX, etc.)

3. What are the benefits of a multiprocessor system?

A Multiprocessor system is a type of system that includes two or more CPUs. It involves the processing of different computer programs at the same time mostly by a computer system with two or more CPUs that are sharing single memory.

Benefits:

Such systems are used widely nowadays to improve performance in systems that are running multiple programs concurrently.

By increasing the number of processors, a greater number of tasks can be completed in unit time.

One also gets a considerable increase in throughput and is cost-effective also as all processors share the same resources.

It simply improves the reliability of the computer system.

4. What is RAID structure in OS? What are the different levels of RAID configuration?

RAID (Redundant Arrays of Independent Disks) is a method used to store data on Multiple hard disks therefore it is considered as data storage virtualization technology that combines multiple hard disks. It simply balances data protection, system performance, storage space, etc. It is used to improve the overall performance and reliability of data storage. It also increases the storage capacity of the system and its main purpose is to achieve data redundancy to reduce data loss.

Different levels of RAID

Nowadays, RAID is available in various schemes or RAID level as given below:

RAID 0 - Non-redundant striping: This level is used to increase the performance of the server.

RAID 1 - Mirroring and duplexing: This level is also known as disk mirroring and is considered the simplest way to implement fault tolerance.

RAID 2 - Memory-style error-correcting codes: This level generally uses dedicated hamming code parity I.e., a liner form of error correction code.

RAID 3 - Bit-interleaved Parity: This level requires a dedicated parity drive to store parity information.

RAID 4 - Block-interleaved Parity: This level is similar to RAID 5 but the only difference is that this level confines all parity data to a single drive.

RAID 5 - Block-interleaved distributed Parity: This level provides far better performance than disk mirroring and fault tolerance.

RAID 6 - P+Q Redundancy: This level generally provides fault tolerance for two drive failures.

5. What is GUI?

GUI (Graphical User Interface) is basically a type of user interface that allows users to use graphics to interact with OS. GUI is created because it is more user-friendly, less complex, and easier to understand rather than a command-line interface. Its main goal is to increase efficiency and ease of use. Instead of having to memorize commands, users can just click on a button to simply execute the procedure. Examples of GUI include Microsoft Windows, macOS, Apple's iOS, etc.

6. What is a Pipe and when it is used?

The pipe is generally a connection among two or more processes that are interrelated to each other. It

is a mechanism that is used for inter-process communication using message passing. One can easily send information such as the output of one program process to another program process using a pipe. It can be used when two processes want to communicate one-way i.e., inter-process communication (IPC).

7. What are the different kinds of operations that are possible on semaphore?

There are basically two atomic operations that are possible:

Wait()

Signal()

8. What is a bootstrap program in OS?

It is generally a program that initializes OS during startup i.e., first code that is executed whenever computer system startups. OS is loaded through a bootstrapping process or program commonly known as booting. Overall OS only depends on the bootstrap program to perform and work correctly. It is fully stored in boot blocks at a fixed location on the disk. It also locates the kernel and loads it into the main memory after which the program starts its execution.

9. Explain demand paging?

Demand paging is a method that loads pages into memory on demand. This method is mostly used in virtual memory. In this, a page is only brought into memory when a location on that particular page is referenced during execution. The following steps are generally followed:

Attempt to access the page.

If the page is valid (in memory) then continue processing instructions as normal.

If a page is invalid then a page-fault trap occurs.

Check if the memory reference is a valid reference to a location on secondary memory. If not, the process is terminated (illegal memory access). Otherwise, we have to page in the required page.

Schedule disk operation to read the desired page into main memory.

Restart the instruction that was interrupted by the operating system trap.

10. What do you mean by RTOS?

Real Time Operating System (RTOS) is an operating system that is used for real-time applications i.e., for those applications where data processing should be done in a fixed and small measure of time. It performs much better on tasks that are needed to be executed within a short time. It also takes care of execution, monitoring, and all-controlling processes. It also occupies less memory and consumes fewer resources.

Types of RTOS:

Hard Real-Time

Firm Real-Time

Soft Real-Time

RTOS is used in Air traffic control systems, Anti-lock Brake Systems, and Heart pacemakers.

11. What do you mean by process synchronization?

Process synchronization is basically a way to coordinate processes that use shared resources or

data. It is very much essential to ensure synchronized execution of cooperating processes so that will maintain data consistency. Its main purpose is to share resources without any interference using mutual exclusion. There are two types of process synchronization:

Independent Process

Cooperative Process

12. What is IPC? What are the different IPC mechanisms?

IPC (Interprocess Communication) is a mechanism that requires the use of resources like a memory that is shared between processes or threads. With IPC, OS allows different processes to communicate with each other. It is simply used for exchanging data between multiple threads in one or more programs or processes. In this mechanism, different processes can communicate with each other with the approval of the OS.

Different IPC Mechanisms:

Pipes

Message Queuing

Semaphores

Socket

Shared Memory

Signals

13. What is different between main memory and secondary memory.

Main memory: Main memory in a computer is RAM (Random Access Memory). It is also known as

primary memory or read-write memory or internal memory. The programs and data that the CPU requires during the execution of a program are stored in this memory.

Secondary memory: Secondary memory in a computer are storage devices that can store data and programs. It is also known as external memory or additional memory or backup memory or auxiliary memory. Such storage devices are capable of storing high-volume data. Storage devices can be hard drives, USB flash drives, CDs, etc.

Primary MemorySecondary MemoryData can be directly accessed by the processing unit.Firstly, data is transferred to primary memory and after then routed to the processing unit.It can be both volatile and non-volatile in nature.It is non-volatile in nature.It is more costly than secondary memory.It is more cost-effective or less costly than primary memory.It is temporary because data is stored temporarily.It is permanent because data is stored permanently.In this memory, data can be lost whenever there is a power failure.In this memory, data is stored permanently and therefore cannot be lost even in case of power failure.It is much faster than secondary memory and saves data that is currently used by the computer.It is slower as compared to primary memory and saves different kinds of data in different formats.It can be accessed by data.It can be accessed by I/O channels.

14. What do you mean by overlays in OS?

Overlays is basically a programming method that divides processes into pieces so that instructions that are important and need can be saved in memory. It does not need any type of support from the OS. It can run programs that are bigger in size than physical

memory by only keeping only important data and instructions that can be needed at any given time.

15. Write top 10 examples of OS?

Some of the top OS's that are used mostly are given below:

MS-Windows

Ubuntu

Mac OS

Fedora

Solaris

Free BSD

Chrome OS

CentOS

Debian

Android

Intermediate OS Interview Questions

16. What is virtual memory?

It is a memory management technique feature of OS that creates the illusion to users of a very large (main) memory. It is simply space where a greater number of programs can be stored by themselves in the form of pages. It enables us to increase the use of physical memory by using a disk and also allows us to have memory protection. It can be managed in two common ways by OS i.e., paging and segmentation. It acts as temporary storage that can be used along with RAM for computer processes.

17. What is thread in OS?

Thread is a path of execution that is composed of a program counter, thread id, stack, and set of registers within the process. It is a basic unit of CPU utilization that makes communication more effective and efficient, enables utilization of multiprocessor architectures to a greater scale and greater efficiency, and reduces the time required in context switching. It simply provides a way to improve and increase the performance of applications through parallelism. Threads are sometimes called lightweight processes because they have their own stack but can access shared data.

Multiple threads running in a process share: Address space, Heap, Static data, Code segments, File descriptors, Global variables, Child processes, Pending alarms, Signals, and signal handlers.

Each thread has its own: Program counter, Registers, Stack, and State.

18. What is a process? What are the different states of a process?

The process is basically a program that is currently under execution. The main function of an OS is to manage and handle all of these processes. When a program is loaded into the memory and it becomes a process, it can be divided into four sections — stack, heap, text, and data. There are two types of processes:

Operating System Processes

User Processes

States of Process:

Different states of the process through which process goes are given below:

New State: In this state, a process is just created.

Running: In this state, the CPU starts working on the process's instructions.

Waiting: In this state, the process cannot run because it just waits for some event to occur

Ready: In this state, the process has all resources available that are required to run but it waits to get assigned to a processor because CPUs are not working currently on instructions passed by the process.

Terminate: In this state, the process is completed I.e., the process has finished execution.

19. What do you mean by FCFS?

FCFS (First Come First Serve) is a type of OS scheduling algorithm that executes processes in the same order in which processes arrive. In simple words, the process that arrives first will be executed first. It is non-preemptive in nature. FCFS scheduling may cause the problem of starvation if the burst time of the first process is the longest among all the jobs. Burst time here means the time that is required in milliseconds by the process for its execution. It is also considered the easiest and simplest OS scheduling algorithm as compared to others. Implementation of FCFS is generally managed with help of the FIFO (First In First Out) queue.

20. What is Reentrancy?

Reentrant is simply a function in which various clients can use and shares a single copy of a program during a similar period. This concept is generally associated with OS code and does not deal with concurrency. It has two major functions:

Program code cannot change or modify itself.

Local data for every client process needs to be stored in different disks.

21. What is a Scheduling Algorithm? Name different types of scheduling algorithms.

A scheduling algorithm is a process that is used to improve efficiency by utilizing maximum CPU and providing minimum waiting time to tasks. It simply deals with the problem of deciding which of outstanding requests is to be allocated resources. Its main aim is to reduce resource starvation and to ensure fairness amongst parties that are utilizing the resources. In simple words, it is used to allocate resources among various competing tasks.

Types of Scheduling Algorithm

There are different types of scheduling algorithms as given below:

First-Come, First-Served (FCFS) Scheduling

Shortest-Job-Next (SJN) Scheduling

Priority Scheduling

Shortest Remaining Time

Round Robin(RR) Scheduling

Multiple-Level Queues Scheduling

First Come First Serve (FCFS)

Jobs are executed on first come, first serve basis.

It is a non-preemptive, pre-emptive scheduling algorithm.

Easy to understand and implement.

Its implementation is based on FIFO queue.

Poor in performance as average wait time is high.

Shortest Job Next (SJN)

This is also known as shortest job first, or SJF

This is a non-preemptive, pre-emptive scheduling algorithm.

Best approach to minimize waiting time.

Easy to implement in Batch systems where required CPU time is known in advance.

Impossible to implement in interactive systems where required CPU time is not known.

The processer should know in advance how much time process will take.

Priority Based Scheduling

Priority scheduling is a non-preemptive algorithm and one of the most common scheduling algorithms in batch systems.

Each process is assigned a priority. Process with highest priority is to be executed first and so on.

Processes with same priority are executed on first come first served basis.

Priority can be decided based on memory requirements, time requirements or any other resource requirement.

Shortest Remaining Time

Shortest remaining time (SRT) is the preemptive version of the SJN algorithm.

The processor is allocated to the job closest to completion but it can be preempted by a newer ready job with shorter time to completion.

Impossible to implement in interactive systems where required CPU time is not known.

It is often used in batch environments where short jobs need to give preference.

Round Robin Scheduling

Round Robin is the preemptive process scheduling algorithm.

Each process is provided a fix time to execute, it is called a quantum.

Once a process is executed for a given time period, it is preempted and other process executes for a given time period.

Context switching is used to save states of preempted processes.

Multiple-Level Queues Scheduling

Multiple-level queues are not an independent scheduling algorithm. They make use of other existing algorithms to group and schedule jobs with common characteristics.

Multiple queues are maintained for processes with common characteristics.

Each queue can have its own scheduling algorithms.

Priorities are assigned to each queue.

For example, CPU-bound jobs can be scheduled in one queue and all I/O-bound jobs in another queue. The Process Scheduler then alternately selects jobs from each queue and assigns them to the CPU based on the algorithm assigned to the queue.

22. What is the difference between paging and segmentation?

Paging: It is generally a memory management technique that allows OS to retrieve processes from secondary storage into main memory. It is a non-contiguous allocation technique that divides each process in the form of pages.

Segmentation: It is generally a memory management technique that divides processes into modules and parts of different sizes. These parts and modules are known as segments that can be allocated to process.

PagingSegmentationIt is invisible to a programmer.It is visible to a programmer.In this, the size of pages is fixed.In this, the size of segments is not fixed.Procedures and data cannot be separated in paging.Procedures and data can be separated in segmentation.It allows a cumulative total of virtual address spaces to cross physical main memory.It allows all programs, data, and codes to break up into independent address spaces.It is mostly available on CPUs and MMU chips.It is mostly available on Windows servers that may support backward compatibility, while Linux has limited support.It is faster for memory access as compared to segmentation.It is slower as compared to paging.In this, OS needs to maintain a free frame.In this, OS needs to maintain a list of holes in the main memory.In paging, the type of fragmentation is internal.In segmentation, the type of fragmentation is external.The size of the page is determined by available memory.The size of the page is determined by the user.

23. What is thrashing in OS?

It is generally a situation where the CPU performs less productive work and more swapping or paging work. It spends more time swapping or paging activities rather than its execution. By evaluating the level of

CPU utilization, a system can detect thrashing. It occurs when the process does not have enough pages due to which the page-fault rate is increased. It inhibits much application-level processing that causes computer performance to degrade or collapse.

24. What is the main objective of multiprogramming?

It refers to the ability to execute or perform more than one program on a single processor machine. This technique was introduced to overcome the problem of underutilization of CPU and main memory. In simple words, it is the coordination of execution of various programs simultaneously on a single processor (CPU). The main objective of multiprogramming is to have at least some processes running at all times. It simply improves the utilization of the CPU as it organizes many jobs where the CPU always has one to execute.

25. What do you mean by asymmetric clustering?

Asymmetric Clustering is generally a system in which one of the nodes among all nodes is in hot standby mode whereas the rest of all nodes run different applications. It simply uses whole or entire hardware resources therefore it is considered a more reliable system as compared to others.

26. What is the difference between multitasking and multiprocessing OS?

Multitasking: It is a system that allows more efficient use of computer hardware. This system works on more than one task at one time by rapidly switching between various tasks. These systems are also known as time-sharing systems.

Multiprocessing: It is a system that allows multiple or various processors in a computer to process two or more different portions of the same program simultaneously. It is used to complete more work in a shorter period of time.

MultitaskingMultiprocessingIt performs more than one task at a time using a single processor.It performs more than one task at a time using multiple processors.In this, the number of CPUs is only one.In this, the number of CPUs is more than one.It is more economical.It is less economical.It is less efficient than multiprocessing.It is more efficient than multitasking.It allows fast switching among various tasks.It allows smooth processing of multiple tasks at once.It requires more time to execute tasks as compared to multiprocessing.It requires less time for job processing as compared to multitasking.

27. What do you mean by Sockets in OS?

The socket in OS is generally referred to as an endpoint for IPC (Interprocess Communication). Here, the endpoint is referred to as a combination of an IP address and port number. Sockets are used to make it easy for software developers to create network-enabled programs. It also allows communication or exchange of information between two different processes on the same or different machines. It is mostly used in client-server-based systems.

Types of Sockets

There are basically four types of sockets as given below:

Stream Sockets

Datagram Sockets

Sequenced Packet Sockets

Raw Sockets

28. Explain zombie process?

Zombie process, referred to as a defunct process, is basically a process that is terminated or completed but the whole process control block is not cleaned up from the main memory because it still has an entry in the process table to report to its parent process. It does not consume any of the resources and is dead, but it still exists. It also shows that resources are held by process and are not free.

29. What do you mean by cascading termination?

Cascading termination is a process termination in which if the parent process is exiting or terminating then the children process will also get terminated. It does not allow the child to continue processing as its parent process terminates. It is generally initiated by OS.

30. What is starvation and aging in OS?

Starvation: It is generally a problem that usually occurs when a process has not been able to get the required resources it needs for progress with its execution for a long period of time. In this condition, low priority processes get blocked and only high priority processes proceed towards completion because of which low priority processes suffer from lack of resources.

Aging: It is a technique that is used to overcome the situation or problem of starvation. It simply increases the priority of processes that wait in the system for resources for a long period of time. It is considered the best technique to resolve the problem of starvation as it adds an aging factor to the priority of

each and every request by various processes for resources. It also ensures that low-level queue jobs or processes complete their execution.

Advanced OS Interview Questions

31. What do you mean by Semaphore in OS? Why is it used?

Semaphore is a signaling mechanism. It only holds one positive integer value. It is simply used to solve the problem or issue of critical sections in the synchronization process by using two atomic operations i.e., wait() and signal().

Types of Semaphore

There are usually two types of semaphores as given below:

Binary Semaphore

Counting Semaphore

Binary SemaphoreMutexIt allows various process threads to get the finite instance of the resource until resources are available.It allows various process threads to get single shared resource only at a time.Its functions are based upon signaling mechanisms.Its functions are based upon a locking mechanism.Binary semaphores are much faster as compared to Mutex.Mutex is slower as compared to binary semaphores.It is basically an integer.It is basically an object.

32. What is Kernel and write its main functions?

The kernel is basically a computer program usually considered as a central component or module of OS. It is responsible for handling, managing, and controlling all operations of computer systems and hardware. Whenever the system starts, the kernel is

loaded first and remains in the main memory. It also acts as an interface between user applications and hardware.

Functions of Kernel:

It is responsible for managing all computer resources such as CPU, memory, files, processes, etc.

It facilitates or initiates the interaction between components of hardware and software.

It manages RAM memory so that all running processes and programs can work effectively and efficiently.

It also controls and manages all primary tasks of the OS as well as manages access and use of various peripherals connected to the computer.

It schedules the work done by the CPU so that the work of each user is executed as efficiently as possible.

33. What are different types of Kernel?

There are basically five types of Kernels as given below:

Monolithic Kernel

MicroKernel

Hybrid Kernel

Nano Kernel

Exo Kernel

34. Write difference between micro kernel and monolithic kernel?

MicroKernel: It is a minimal OS that executes only important functions of OS. It only contains a near-minimum number of features and functions that are required to implement OS.

Example: QNX, Mac OS X, K42, etc.

Monolithic Kernel: It is an OS architecture that supports all basic features of computer components such as resource management, memory, file, etc.

Example: Solaris, DOS, OpenVMS, Linux, etc.

MicroKernelMonolithic KernelIn this software or program, kernel services and user services are present in different address spaces.In this software or program, kernel services and user services are usually present in the same address space.It is smaller in size as compared to the monolithic kernel.It is larger in size as compared to a microkernel.It is easily extendible as compared to a monolithic kernel.It is hard to as extend as compared to a microkernel.If a service crashes, it does affect on working of the microkernel.If a service crashes, the whole system crashes in a monolithic kernel.It uses message queues to achieve inter-process communication.It uses signals and sockets to achieve inter-process communication.

35. What is SMP (Symmetric Multiprocessing)?

SMP is generally referred to as computer architecture in which the processing of programs is done by multiple processors that share a common OS and memory. SMP is very much required if you want to take advantage of multiprocessor hardware. It simply enables any processor to work on any of the tasks no matter where data or resources for that particular task are located in memory. These systems are more reliable than single-processor systems.

36. What is a time-sharing system?

It is a system that allows more than one user to access the resources of a particular system in many locations. In simple words, it performs multiple tasks on a single processor or CPU. As the name suggests, it means to share time into multiple slots in several processes. It also allows different users from different locations to use a particular computer system at the same time therefore it is considered one of the important types of OS.

37. What is Context Switching?

Context switching is basically a process of saving the context of one process and loading the context of another process. It is one of the cost-effective and time-saving measures executed by CPU the because it allows multiple processes to share a single CPU. Therefore, it is considered an important part of a modern OS. This technique is used by OS to switch a process from one state to another i.e., from running state to ready state. It also allows a single CPU to handle and control various different processes or threads without even the need for additional resources.

38. What is difference between Kernel and OS?

Kernel: Kernel is a system program that controls all programs running on the computer. The kernel is basically a bridge between the software and hardware of the system.

Operating System: Operating system is a system program that runs on the computer to provide an interface to the computer user so that they can easily operate on the computer.

KernelOSIt is considered a central component of OSIt is considered system software.It is generally

responsible for converting user commands into machine-level commands.It is generally responsible for managing the resources of system.It simply acts as an interface between hardware and applications.It simply acts as an interface between hardware and user.It also performs functions like process management, file management, device management, I/O communication, etc.It also performs functions like providing security to data and files in the the system, providing access controls to users, maintaining the system privacy, etc.Its type includes Microkernel, Monolithic kernel, etc.Its type includes Single and Multiprogramming batch systems, Distributed OS, Real-time OS.

39. What is difference between process and thread?

Process: It is basically a program that is currently under execution by one or more threads. It is a very important part of the modern-day OS.

Thread: It is a path of execution that is composed of the program counter, thread id, stack, and set of registers within the process.

ProcessThreadIt is a computer program that is under execution.It is the component or entity of the process that is the smallest execution unit.These are heavy-weight operators.These are lightweight operators.It has its own memory space.It uses the memory of the process they belong to.It is more difficult to create a process as compared to creating a thread.It is easier to create a thread as compared to creating a process.It requires more resources as compared to thread.It requires fewer resources as compared to processes.It takes more time to create and terminate a process as compared to a thread.It takes less time to create and terminate a thread as compared to a process.It usually run-in separate memory space.It usually run-

in shared memory space.It does not share data.It shares data with each other.It can be divided into multiple threads.It can't be further subdivided.

40. What are various sections of the process?

There are basically four sections in the process as given below:

Stack: It is used for local variables and returns addresses.

Heap: It is used for dynamic memory allocation.

Data: It stores global and static variables.

Code or text: It comprises compiled program code.

41. What is a deadlock in OS? What are the necessary conditions for a deadlock?

Deadlock is generally a situation where a set of processes are blocked as each process is holding resources and waits to acquire resources held by another process. In this situation, two or more processes simply try to execute simultaneously and wait for each to finish their execution because they are dependent on each other. We can see a hand problem in our system whenever a deadlock occurs in a program. It is one of the common problems you can see in multiprocessing.

Necessary Conditions for Deadlock

There are basically four necessary conditions for deadlock as given below:

Mutual Exclusion

Hold and Wait

No Pre-emption

Circular Wait or Resource Wait

42. What do you mean by Belady's Anomaly?

In the Operating System, process data is loaded in fixed-sized chunks and each chunk is referred to as a page. The processor loads these pages in the fixed-sized chunks of memory called frames. Belady's Anomaly is a phenomenon in which if we increase the number of frames in memory, then the number of page faults also increases. It is generally experienced when we use FIFO (First in First out) page replacement algorithm.

43. What is spooling in OS?

Spooling simply stands for Simultaneous peripheral operations online. It is referred to as putting data of various I/O jobs in a buffer. Here, buffer means a special area in memory or hard disk that can be accessible to an I/O device. It is used for mediation between a computer application and a slow peripheral. It is very useful and important because devices access or acquire data at different rates. This operation also uses disk as a very large buffer and is capable of overlapping I/O operations for one task with processor operations for another task.

Question: What is an operating system?

Answer: It is a program that provides an interface between the software and hardware of a computer. In other words, an OS offers an environment for the user to execute software using hardware.

Question: Name some functions of the operating system.

Answer:

Memory management

Processor management

Device management

File management

Security

Job accounting

Control over system performance

Error detection

Communicate between user and software

Communication between software and hardware.

Question: Name the different operating systems.

Answer:

Batched operating system.

Interactive operating system

Multi-processing operating system

Multitasking operating system

Distributed operating system

Multi-programmed operating system

Real-Time operating system

Timesharing operating system

Question: List the basic functions of OS file management.

Answer:

Create and delete directories and files.

Use secondary storage for creating backup files.

Map file in secondary storage.

Give support to file modification.

Question: What is booting?

Answer: It is a procedure of turning on the computer by loading the kernel.

Question: What is the bootstrap program?

Answer: It is a program that resides in the kernel of an operating system, and when we boot the system, it is the first program that executes and stores the read-only memory (ROM).

Question: What is the use of an operating system?

Answer: An operating system acts as a management system between the system software and hardware, and guides hardware to act according to the provided software. It also controls the flow of the program and provides an environment so the software can communicate with system hardware.

Question: Define a multi-programming system.

Answer: In the multi-programming system, the system keeps different programs in different parts of the main memory simultaneously, and executes each of those concurrently.

Question: Define multitasking systems.

Answer: In a multitasking system, programs are kept in the main memory so the system can execute them simultaneously.

Question: What are the time-sharing systems?

Answer: In time-sharing systems, multiple users can use a specific program from different terminals at the same time.

Operating System Interview Questions Set-II [11 to 20]

Question: Give the advantages of a multiprocessor system.

Answer: Multi-processor, as the name suggests, uses more than one processor. With an increase in the processor count, the processing capability of the system increases too.

Question: What is virtual memory?

Answer: Virtual memory is a memory management method that helps to execute a process using primary and secondary memories. Though the program gets executed using the main memory, the resources and pages load from the secondary memory.

Question: What is a kernel in an operating system?

Answer: It is an essential part of the operating system, also known as the core of the OS. It is present in the main memory of the system and loads before any other part of the operating system. Every OS consists of a kernel. For example, the Linux kernel is one of the famous kernels, and Android also uses this kernel.

Question: What are the main functions of a kernel in an operating system?

Answer:

Process management

Resource management

Disk management

Memory management

Device management

Facilitate communication between hardware and software.

Question: Define the 2 most popular types of kernels.

Answer: Though there are many types of kernels, only 2 of them are the most popular:

Monolithic Kernel

MicroKernel

Monolithic Kernel: In this type of OS kernel, all the user services and kernel services reside in the same memory space. Old operating systems would use this type of kernel. Some examples are Windows 95, 98, and Unix. Linux also uses it.

MicroKernel: This type of kernel is small in size, and all the user and kernel services reside in different memory addresses. Operating systems like macOS and Windows use microkernel.

Question: Give some disadvantages of Microkernel.

Answer:

Complex process management.

Debugging the messaging is complex.

Loss in performance because of the requirement of more software.

Question: What is SMP?

Answer: It stands for Symmetric Multiprocessing (SMP), and it is an architecture that contains multiple processors to complete the process. All the processors share a single memory.

Question: What is asymmetric clustering?

Answer: Asymmetric clustering occurs when the server running the application finds some kind of cluster. In asymmetric clustering, one server tries to

run the server application while others remain on standby mode.

Question: Explain a thread?

Answer: It is a flow of execution through the process code. A thread deals with the instruction to be executed.

Question: What is demanding paging?

Answer: Demanding pages is a concept used by the virtual machine. Only a part of the process needs to be present in the main memory to execute some process, which means that only a few pages will only be present in the main memory at any time, and the rest will be kept in the secondary memory.

Operating System Interview Questions Set-III [21 to 30]

Question: What is a process?

Answer: A program in execution is known as a process.

Question: Name all the states of a Process.

Answer:

New

Running

Waiting

Ready

Terminate

Question: How is a thread different from a process?

Answer:

The process is independent, whereas a thread is not.

A thread can assist other threads, whereas the process can not.

If one thread stops, the next thread starts executing, but this is not the case with a process.

Question: What is a deadlock?

Answer: When 2 processes are trying to execute simultaneously, and they are waiting for each other to finish the execution, as they are dependent on each other, this halt in execution is known as a deadlock. When the deadlock occurs in the program, the system usually freezes.

Question: What are the necessary conditions for a deadlock?

Answer:

Mutual Exclusion

Hold and wait

No preemption

Circular wait

Question: What is starvation?

Answer: When a program is in process, and it does not get all the resources to execute, because other processes are using the same resources then this problem of not getting all needed resources is known as starvation.

Question: What is the difference between multitasking and multi-processing operating systems?

Answer:

Multi-TaskingMulti-ProcessingThe operating system executes more than one task simultaneously using a single processor.The operating system executes more

than one task using multiple processors.Only one processor executes the tasks.More than one processor executes tasks.It takes a moderate amount of time to execute all the tasks.It generally takes very little time to execute all tasks.The processor shifts from one task to another, which makes it look like it is executing multiple tasks simultaneously, but, actually, here we only have one processor for task execution.Here, we have more than one processor. So multiple processes can be executed at the same time.

Question: Differentiate between paging and segmentation.

Answer:

PagingSegmentationDivides the virtual memory into physical memory.Divides the physical memory to the logical memory.Paging divides the memory into fixed length.Segmentation divides the memory into arbitrary memory length.Only loads information about the process.Loads the full logical portion of the page.Pages are smaller than segments.Segments are generally larger.It's the hardware that divides the paging memory.The software divides the segmentation memory.

Question: What is a command interpreter?

Answer: It is a text field I/O interface between the user and the operating system. In the command interpreter, the user gives input through the keyboard using CLI commands. Command Prompt in Windows and Terminal in Linux and macOS are examples of the command interpreter.

Question: What is a daemon?

Answer: It stands for Disk and Execution monitor, and it is a long-running background process that acts on the request. The life cycle of the daemon

commences with the system booting and continues until the system shuts down.

Operating System Interview Questions Set-IV [31 to 40]

Question: From where does the daemon originate and how we classify it?

Answer: The term daemon originated with UNIX. In UNIX, the daemon conventionally ends with ‘d’, for example ‘inetd’, ‘nfsd’, httpd’, and ‘lpd’.

Question: What is the race condition?

Answer: It is a situation that occurs when different operations are performed on the same data simultaneously, and the outcome of the execution depends on the order of the operations performed on the data. Evidently, the race condition can provide an undesirable outcome.

Question: What is process synchronization?

Answer: When the race condition occurs, it can lead to an undesirable outcome. So to prevent the race condition, we follow a process known as synchronization. Here, we ensure that only one process executes at a time.

Question: Explain PCB?

Answer: PCB stands for Process Control Block, and it an operating system data structure, which can collect and store information about the processes. It is also known as the process descriptor.

As soon as a process gets created, the OS creates a corresponding PCB to store the process status and information. With each transition, OS updates the PCB data structure.

Question: What is Semaphore?

Answer: It is a variable that is used to create a synchronized process. There are 2 types of semaphores:

Counting semaphore.

Binary semaphore.

Counting semaphore can have positive integer values, and Binary semaphore can only have 1 and 0 as variables.

Question: Explain FCFS and the main problem it causes.

Answer: It stands for First Come First Serve (FCFS), and it is a scheduling algorithm. According to this algorithm, the CPU serves that process first, which approaches it first. FCFS can cause the starvation problem in which the process does not get the proper resources.

Question: Name the different RAID levels.

Answer:

0 – Non-redundant striping

1 – Mirrored Disks

2 – Memory-style error-correcting codes

3 – Bit-interleaved Parity

4 – Block-interleaved Parity

5 – Block-interleaved distributed Parity

6 – P+Q Redundancy

Question: What is cache memory?

Answer: It is a volatile computer memory directly attached to the register, which provides high-speed data access to the processor.

Question: What is IPC?

Answer: IPC stands for Inter-Process Communication, and it is a mechanism, in which various processes can communicate with each other with the approval of the OS.

Question: Name the Various IPC mechanisms.

Answer:

Sockets

Pipe

Shared Memory

Signals

Message Queues

Operating System Interview Questions Set-V [41 to 50]

Question: What is a context switch?

Answer: Context can be referred to as the data in the register. A context switch is a procedure in which the CPU changes from one task to another task.

Question: Give the difference between compiler and Interpreter.

Answer: A compiler first reads all the code at once and then tries to execute it, whereas an interpreter reads the code line by line and simultaneously executes it.

Question: What are sockets?

Answer: Sockets are the Inter-process Communication mechanisms that are used to provide

point-to-point communication between 2 processes.

Sockets are often utilized in client-server applications because many protocols, such as FTP, SMTP, and POP3 use sockets to implement the connection between server and client.

Question: What do you understand by the main memory and secondary memory?

Answer: Main memory is directly connected to the computer processor, and it acts as a bridge between computer processors and secondary memory. The main objective of the main memory is to get the data from the secondary memory and feed it to the processor so that the appropriate actions could be performed.

RAM and ROM are the 2 main memories used by the system, whereas hard disk and other large-sized memories form the secondary memory.

As compared to the secondary memory, the main memory is straightforward and it is fast to access data from the main memory. That's why processors directly communicate with the main memory.

Generally, the main memory does not store data permanently. Instead, it only holds data for a specific time and tries to give it to the processor for the further execution process.

Question: Can there be a deadlock situation with a single process?

Answer: No, to occur a deadlock situation, we need at least 2 dependent processes. A deadlock situation can only arise when these 4 conditions coincide:

Hold and Wait

No Preemption

Mutual Exclusion

Circular wait.

Question: What are interrupts?

Answer: These are the signals generated by the external input devices to stop the ongoing active process of the CPU. Interrupts use context switching so the CPU can switch between the current process and the new signal generated by the external device. Interrupts help in prioritizing the process execution of the CPU.

Question: What are zombie processes?

Answer: Formally, these processes are known as defunct processes. If a child process is still in the process table even after the parent process has been executed, this scenario could cause a zombie process.

Even the kill commands do not have any effect on these processes. If the Wait System Call read the exit status of the process, then the zombie process would remove from the process table.

Question: Explain pipe in OS?

Answer: Pipe is the method for exchanging information between processes. Generally, pipe forms a one-way communication, which means by using a pipe, a process can only send information, such as output or other parameters of the process to another process.

For setting a two-way communication between 2 processes, we require 2 pipes for both directions.

Question: What is the limitation of pipes for two-way communication between 2 processes?

Answer: If both the processes are the child process of the same parent, then only two-way pipe communication could be set between the processes.

Question: What do you know about the named pipe?

Answer: Generally, we use the un-named pipe to set communication between the related process, but if we want to communicate unrelated processes, then we need to use named pipes. Like a traditional unnamed pipe, named pipe is also a part of IPC (Interprocess Communication), and its life remains until the system is on.

Operating System Interview Questions Set-VI [51 to 60]

Question: Name the operations which are possible on a semaphore.

Answer: We can only perform 2 operations on a semaphore:

Wait, and

Signal.

Question: What do you know about mutex?

Answer: It is an abbreviation for Mutual Exclusion. It is a userspace program object that helps multiple threads to access the same resource, but not simultaneously. The sole purpose of a mutex is to lock a thread with a resource so the other threads can not use the same resource until the first thread finish executing.

Question: What is a critical section?

Answer: The program will behave oddly if program parts perform concurrent access to the shared resources. So to protect the shared resources of a

program, we create a protected section, which is known as the critical section or critical region.

A critical section can only execute one process at a time, and this eliminates the problems that can be caused by concurrent accessing resources.

Question: What is process scheduling?

Answer: It is a routine followed by the process manager of the system. In this, the process manager can use different methods and strategies to remove a particular running process or select another process for the CPU.

Question: What is the difference between preemptive and non-preemptive scheduling?

Answer: Scheduling is divided into 2 categories; preemptive scheduling and non-preemptive scheduling.

Preemptive SchedulingNon-Preemptive SchedulingProcesses are allocated to the CPU for a limited period.A process remains in the CPU till it gets entirely executed.If there is a new process that comes with high priority, then the ongoing CPU process has to stop.Here the priority of the process does not matter. The new process has to wait until the first process finishes execution.There is a continuous switching between the running and ready states of the processes.This is not the case in non-preemptive scheduling.Preemptive schedules the process on the basis of their priority.Non-preemptive uses the process burst time.There is a high probability that the process with less priority will starve.Here process with less burst time will starve.

Question: Name the various scheduling algorithms.

Answer:

First Come First Serve (FCFS).

Shortest Job First (SJF).

Priority Scheduling

Round Robin Scheduling

First Come First Serve: It follows the non-preemptive scheduling, and here the process requesting first gets the CPU.

Shortest Job First: It could be preemptive or non-preemptive. In this algorithm, that process gets the CPU that is closest to its execution. Here, CPU gives priority to those jobs which have a low execution time.

Priority Based Scheduling: It is also a preemptive algorithm, and here CPU is allocated to those processes first that have a high priority.

Round Robin Scheduling: It is a preemptive scheduling algorithm, and here each process gets equal time for execution.

Question: What are condition variables?

Answer: These are the synchronization objects, which can set some conditions for threads, and if the condition occurs then only the appropriate operations can be performed by the threads.

If the situation does not arise, then the threads have to wait for further execution. A condition variable is often used with critical sections and slim readers, where they help in binding and holding the threads.

Question: What is the reader-writer lock?

Answer: Reader-writer lock is used to prevent data integrity. This lock allows concurrent access to read

operation, which means multiple threads can read data simultaneously.

But it does not allow concurrent write, and if one thread wants to modify data via writing, then all the other threads will be blocked from reading or writing data.

Question: What are the different types of memory used by the system?

Answer:

Main memory, such as RAM and ROM.

Secondary memory, such as hard disk and e-drives.

Cache.

Internal process memory, such as registers.

Question: What is compaction?

Answer: The free memory of the system gets split into smaller pieces when a process loads or is removed from the memory. Compaction helps in accumulating these small loose pieces of memory into one substantial chunk so that more memory can be allocated to other processes.

Operating System Interview Questions Set-VII [61 to 70]

Question: What is a page in OS?

Answer: A page can be defined as the smallest unit of data, and it is a fixed-length contiguous block of virtual memory.

Question: Explain page frames.

Answer: When a page is transferred from the secondary memory to the main memory, then it requires a fixed length of a continuous physical

memory block, known as a page frame. It is the job of the operating system to map the pages in the page frames.

Question: What is the difference between logical and physical addresses?

Answer:

Logical AddressPhysical AddressThe CPU generates it.It is the real address of the program in the memory.A user can access the logical address of the program.The physical address can be accessed directly.CPU generates a logical address at the execution time.It is generated by the Memory Management Unit(MMU) at the creation time.

Question: What is the page fault?

Answer: It is an error that occurs when the CPU tries to access a specific block of memory address that is not present in the physical memory (RAM).

Question: What is thrashing?

Answer: It is a scenario when continuous page fault and paging activities occur. Thrashing could lead to a program collapse and degraded CPU performance.

Question: What do you know about the library?

Answer: A library is a collection of files that contains subroutines, data, and other objects that can be used by other programs.

Question: What is the difference between a program and a process?

Answer:

ProgramProcessIt is a set of instructions that are written in a specific programming language.It is an instance of a program that is about to be executed by

one or many threads.A program is static in nature that is present in the file.Processes are dynamic and generated during execution time.Programs are generally stored in secondary memory, which makes them portable.Processes are not portable and they reside in the main memory.The program can live in the main memory for eternity.A process time period is limited and it either executes or fails.Programs are passives entities.Processes are active entities.

Question: What are APIs?

Answer: API stands for Application Program Interface, and it is a collection of libraries and subprograms. APIs are used to set communication between 2 programs i.e. API provides a general way of sending and receiving data between applications.

Question: What is Belady's anomaly?

Answer: It is a situation that occurs in the OS when there is an increase in page faults by the CPU because additional memory has been introduced to the system, which results in increasing page frames.

Question: What do you know about cascading termination?

Answer: When a process finishes execution, then the OS terminates the process via the exit system call. Only the parent process can cause the termination of its child processes, so when the parent process gets entirely executed and terminated, then its child process also gets terminated automatically.

This phenomenon of a process triggering termination of another process is known as cascading termination

System Software LAB Viva Questions :-

1. Explain system software.

It consists of variety of programs that supports the operation of the

computer. This software makes it possible for the user to focus on the other problems to be solved with out needing to know how the machine works internally.

Eg: operating system, assembler, loader.

2. Give some applications of operating system.

to make the computer easier to use

to manage the resources in computer

process management

data and memory management

to provide security to the user.

Operating system acts as an interface between the user and the system

Eg:windows,linux,unix,dos

3. Explain compiler and interpreter.

Compiler is a set of program which converts the whole high level

language program to machine language program. Interpreter is a set of programs which converts high level language program to machine

language program line by line.

4. Explain loader.

Loader is a set of program that loads the machine language translated by the translator into the main memory and makes it ready for execution.

5. What is the need of MAR register?

MAR (memory address register) is used to store the address of the

memory from which the data is to be read or to which the data is to be written.

6. Draw SS instruction format.

opcode L B1 D1 B2 D2

0 7 8 15 16 19 20 31 32 35 36 47

It is a 6 byte instruction used to move L+I bytes data fro the storage

location1 to the storage location2.

Storage location1 = D1+[B1]

Storage location2 = D2+[B2]

Eg: MOV 60,400(3),500(4)

7. Give any two differences between base relative addressing and program counter

relative addressing used in SIC/XE.

8. Explain indirect addressing

In the case of immediate addressing the operand field gives the memory

location. The word from the given address is fetched and it gives the address of the operand.

Eg:ADD R5, [600]

Here the second operand is given in indirect addressing mode. First the word in memory location 600 is fetched and which will give the address of the operand.

9. Explain immediate addressing.

In this addressing mode the operand value is given directly. There is no need to refer memory. The immediate addressing is indicated by the prefix '#'.

Eg: ADD #5

In this instruction one operand is in accumulator and the second operand is an immediate value the value 5 is directly added with the accumulator content and the result is stored in accumulator.

10. List out any two CISC and RISC machine.

CISC –Power PC, Cray T3E

RISC – VAX,Pentium Pro architecture

11. Following is a memory configuration:

Address Value Register R

1 5 5

5 7

6 5

12. Following is a memory configuration:

Address Value Register R

4 9 6

5 7

6 2

13. What is the name of A and L register in SIC machine and also specify its use.

A-accumulator: Used for arithmetic operation. i.e., in the case of arithmetic operations one operand is in the accumulator, and other operand may be an immediate value, register operand or memory content. The operation given in the instruction is

performed and the result is stored in the accumulator register.

L-linkage register: It is used to store the return address in the case of jump to subroutine (JSUB) instructions.

14. What are the instruction formats used in SIC/XE architecture? Give any one format.

Format 1 (1 byte), Format 2 (2 bytes), Format 3 (3 bytes) & Format 4(4

bytes)

Format 2:

8 4 4

OPCODE R1 R2

15. Consider the instructions in SIC/ XE programming

10 1000 LENGTH RESW 4

22

20 —— NEW WORD 3

16. What is the difference between the instructions LDA # 3 and LDA THREE?

In the first instruction immediate addressing is used. Here the value 3 is directly loaded into the accumulator register. In the second instruction the memory reference is used. Here the address(address

assigned for the symbol THREE) is loaded into the accumulator register.

17. Differentiate trailing numeric and leading separate numeric.

The numeric format is used to represent numeric values with one digit per byte. In the numeric format

if the sign appears in the last byte it is known as the trailing numeric. If the sign appears in a separate byte preceding the first digit then it is called as leading separate

numeric.

18. What are the addressing modes used in VAX architecture?

Register direct; register deferred, auto increment and decrement,

program counter relative, base relative, index register mode and indirect addressing are the various addressing modes in VAX architecture.

19. How do you calculate the actual address in the case of register indirect with immediate index mode?

Here the target address is calculated using the formula

T.A =(register) + displacement.

20. Write the sequence of instructions to perform the operation BETA = ALPHA + 1 using SIC instructions.

LDA ALPHA

ADD ONE

STA BETA

…. ….

ALPHA RESW 1

BETA RESW 1

ONE RESW 1

21. Write the sequence of instructions to perform the operation

BETA = ALPHA+5

using SIC/XE instructions.

23

LDA ALPHA

ADD #1

STA BETA

…. ….

ALPHA RESW 1

BETA RESW 1

22. What is the use of TD instruction in SIC architecture?

The test device (TD) instruction tests whether the addressed device is

ready to send or receive a byte of data. The condition code is set to indicate the result of this test. Setting of < means the device is ready to send or receive, and = means the device is not ready.

23. What is the result of the following statement?

SUB 4(direct) to R (direct)

Here one operand is in the address location 4(direct addressing) and the next operand is in the register (register direct).

The resultant value is 9 –6 =3.

24. What is the result of the following statement?

Base relative addressing PC relative addressing Here the Target address is calculated using the formula

Target address = Displacement + [B] B-base register

Here the target address is calculated using the formula Target address = Displacement + [PC]

PC-program counter

Displacement lies between 0 to 4095 Displacement lies between –2048 to

2047

21

ADD 6(immediate) to R (indirect)

Here 6 is the immediate data and the next value is indirect data. ie, the register contains the address of the operand. Here the address of the operand is 5 and its corresponding value is 7.

6 + [R] = 6+ [5] = 6+ 7 =13

25. What is the value assign to the symbol NEW?

In the line 10 the address is 1000 and the instruction is RESW 4.It

reserves 4 word (3 x 4 =12) areas for the symbol LENGTH. hence 12 is added to the LOCCTR. Thus the value of the symbol NEW is 1000+12 =100C.

ASSEMBLERS ::

26. Define the basic functions of assembler.

* Translating mnemonic operation codes to their machine language

equivalents.

* Assigning machine addresses to symbolic labels used by the

programmer.

27. What is meant by assembler directives? Give example.

These are the statements that are not translated into machine instructions, but they provide instructions to assembler itself.

example START,END,BYTE,WORD,RESW and RESB.

28. What are forward references?

It is a reference to a label that is defined later in a program.

Consider the statement

10 1000 STL RETADR

. . . .

. . . .

80 1036 RETADR RESW 1

The first instruction contains a forward reference RETADR. If we attempt to translate the program line by line, we will unable to process the statement in line10 because we do not know the address that will be assigned to RETADR .The address is assigned later(in line 80) in the program.

29. What are the three different records used in object program?

The header record, text record and the end record are the three different records used in object program.

The header record contains the program name, starting address and

length of the program.

Text record contains the translated instructions and data of the program.

End record marks the end of the object program and specifies the address in the program where execution is to begin.

30. What is the need of SYMTAB (symbol table) in assembler?

The symbol table includes the name and value for each symbol in the

source program, together with flags to indicate error conditions. Some times it may contain details about the data area. SYMTAB is usually organized as a hash table for efficiency of insertion and retrieval.

31. What is the need of OPTAB (operation code table) in assembler?

The operation code table contains the mnemonic operation code and its

machine language equivalent. Some assemblers it may also contain information about instruction format and length. OPTAB is usually organized as a hash table, with mnemonic operation code as the key.

32. What are the symbol defining statements generally used in assemblers?

'EQU'-it allows the programmer to define symbols and specify their

values directly. The general format is Symbol EQU value

'ORG'-it is used to indirectly assign values to symbols. When this

statement is encountered the assembler resets its location counter to the specified value. The general format is ORG value

In the above two statements value is a constant or an expression

involving constants and previously defined symbols.

33. Explain relocatable program.

An object program that contains the information necessary to perform

required modification in the object code depends on the starting location of the program during load time is known as relocatable program.

34. Differentiate absolute expression and relative expression.

If the result of the expression is an absolute value (constant) then it is known as absolute expression.

Eg: BUFEND – BUFFER

If the result of the expression is relative to the beginning of the program then it is known as relative expression. label on instructions and data areas and references to the location counter values are relative terms.

Eg: BUFEND + BUFFER

35. Write the steps required to translate the source program to object program.

Convert mnemonic operation codes to their machine language

equivalents.

Convert symbolic operands to their equivalent machine addresses

Build the machine instruction in the proper format.

Convert the data constants specified in the source program into their internal machine representation

Write the object program and assembly listing.

36. What is the use of the variable LOCCTR (location counter) in assembler?

This variable is used to assign addresses to the symbols. LOCCTR is

initialized to the beginning address specified in the START statement. After each source statement is processed the length of the assembled instruction or data area to be generated is added to LOCCTR and hence whenever we reach a label in the source program the current value of

LOCCTR gives the address associated with the label.

37. Define load and go assembler.

One pass assembler that generates their object code in memory for

immediate execution is known as load and go assembler. Here no object programmer is written out and hence no need for loader.

38. What are the two different types of jump statements used in MASM assembler?

Near jump

A near jump is a jump to a target in the same segment and it is assembled by using a current

code segment CS.

Far jump

A far jump is a jump to a target in a different code segment and it is assembled by using different segment registers .

39. What is the use of base register table in AIX assembler?

A base register table is used to remember which of the general purpose

registers are currently available as base registers and also the base addresses they contain.

.USING statement causes entry to the table and .DROP statement

removes the corresponding table entry.

40. Differentiate the assembler directives RESW and RESB.

RESW –It reserves the indicated number of words for data area.

Eg: 10 1003 THREE RESW 1

In this instruction one word area (3 bytes) is reserved for the symbol

THREE. If the memory is byte addressable then the address assigned for the next symbol is 1006.

RESB –It reserves the indicated number of bytes for data area.

Eg: 10 1008 INPUT RESB 1

In this instruction one byte area is reserved for the symbol INPUT .Hence the address assigned for the next symbol is 1009.

41. Define modification record and give its format.

This record contains the information about the modification in the object code during program relocation. the general format is Col 1 M

Col 2-7 Starting location of the address field to be modified relative to the beginning of the program

Col 8-9 length of the address field to be modified in half bytes.

42. Write down the pass numbers (PASS 1/ PASS 2) of the following activities that occur in a two pass assembler:

a. Object code generation

b. Literals added to literal table

c. Listing printed

d. Address location of local symbols

Answer:

a. Object code generation – PASS 2

b. Literals added to literal table – PASS 1

c. Listing printed – PASS2

d. Address location of local symbols – PASS1

43. What is meant by machine independent assembler features?

The assembler features that do not depend upon the machine

architecture are known as machine independent assembler features.

Eg: program blocks, Literals.

44. How the register to register instructions are translated in assembler?

In the case of register to register instructions the operand field contains the register name. During the translation first the object code is converted into its

corresponding machine language equivalent with the help of OPTAB. Then the SYMTAB is searched for the

numeric equivalent of register and that value is inserted into the operand field.

Eg: 125 1036 RDREC CLEAR X B410

B4-macine equivalent of the opcode CLEAR

10-numeric equivalent of the register X.

45. What is meant by external references?

Assembler program can be divided into many sections known as control

sections and each control section can be loaded and relocated independently of the others. If the instruction in one control section need to refer instruction or data in another control section.the assembler is unable to process these references in normal way. Such

references between control are called external references.

46. Define control section.

A control section is a part of the program that maintains its identity after assembly; each control section can be loaded and relocated independently of the others. Control sections are most often used for subroutines. The major benefit of using control sections is to increase flexibility.

47. What is the difference between the assembler directive EXTREF and EXTDEF.

EXTDEF names external symbols that are defined in a particular control

section and may be used in other sections. EXTREF names external symbols that are referred in a particular control section and defined in another control section.

48. Give the general format of define record.

This record gives information about external symbols that are defined in a particular control section. The format is

Col 1 D

Col 2-7 name of external symbol defined in this control section

Col 8-13 relative address of the symbol with in this control section

Col 14-73 name and relative address for other external symbols.

49. Give the use of assembler directive CSECT and USE

CSECT – used to divide the program into many control sections

USE – used to divide the program in to many blocks called program blocks

50. What is the use of the assembler directive START?

The assembler directive START gives the name and starting address of

the program.

The format is

PN START 1000

Here

PN – Name of the program

1000 – Starting address of the program.

SS LAB VIVA Questions ::

LOADERS AND LINKERS ::

1. What are the basic functions of loaders?

Loading – brings the object program into memory for execution

Relocation – modifies the object program so that it can be loaded at an address different from the location originally specified

Linking – combines two or more separate object programs and also

supplies the information needed to reference them.

2. Define absolute loader.

The loader, which is used only for loading, is known as absolute loader.

e.g. Bootstrap loader

3. What is meant by bootstrap loader?

This is a special type of absolute loader which loads the first program to be run by the computer. (usually an operating system)

4. What are relative (relocative) loaders?

Loaders that allow for program relocation are called relocating

(relocative) loaders.

5. What is the use of modification record?

Modification record is used for program relocation. Each modification

record specifies the starting address and the length of the field whose value is to be altered and also describes the modification to be performed.

6. What are the 2 different techniques used for relocation?

Modification record method and relocation bit method.

7. Define Relocation bit method.

If the relocation bit corresponding to a word of object code is set to 1, the program's starting address is to be added to this word when the program is relocated. Bit value 0 indicates no modification is required.

8. Define bit mask.

The relocation bits are gathered together following the length indicator in each text record and which is called as bit mask. For e.g. the bit mask FFC(111111111100) specifies that the first 10 words of object code are to be modified during relocation.

9. What is the need of ESTAB?

It is used to store the name and address of the each external symbol. It also indicates in which control section the symbol is defined.

10. What is the use of the variable PROGADDR?

It gives the beginning address in memory where the linked program is to be loaded. The starting address is obtained from the operating system.

11. Write the two passes of a linking loader.

Pass1: assigns address to all external symbols

Pass2: it performs actual loading, relocation and linking.

12. Define automatic library search.

In many linking loaders the subroutines called by the program being

loaded are automatically fetched from the library, linked with the main program and loaded. This feature is referred to as automatic library search.

13. List the loader options INCLUDE &DELETE.

The general format of INCLUDE is INCLUDE program_name (library name)

This command direct the loader to read the designated object program

from a library and treat it as the primary loader input.

The general format of DELETE command is

DELETE Csect-name

It instructs the loader to delete the named control sections from the sets of programs loaded.

14. Give the functions of the linking loader.

The linking loader performs the process of linking and relocation. It

includes the operation of automatic library search and the linked programs are directly loaded into the memory.

15. Define dynamic linking.

If the subroutine is loaded and linked to the program during its first call (run time), then it is called as dynamic loading or dynamic linking.

16. Write the advantage of dynamic linking.

It has the ability to load the routine only when they are needed.

The dynamic linking avoids the loading of entire library for each execution.

17. What is meant by static executable and dynamic executable?

In static executable, all external symbols are bound and ready to run. In dynamic executables some symbols are bound at run time.

18. What is shared and private data?

The data divided among processing element is called shared data. If the data is not shared among processing elements then it is called private data.

19. Write the absolute loader algorithm.

Begin

Read Header record

Verify program name and length

Read first text record

While record type != 'E' do

Begin

Moved object code to specified location in memory

Read next object program record

End

Jump to address specified in End record

MACRO PROCESSORS ::

1. Define macro processor.

Macro processor is system software that replaces each macro instruction with the corresponding group of source language statements. This is also called as expanding of macros.

2. What do macro expansion statements mean?

These statements give the name of the macro instruction being invoked

and the arguments to be used in expanding the macros. These statements are also known as macro call.

3. What are the directives used in macro definition?

MACRO – it identifies the beginning of the macro definition

MEND – it marks the end of the macro definition

4. What are the data structures used in macro processor?

DEFTAB – the macro definitions are stored in a definition table i.e. it contains a macro prototype and the statements that make up the macro body.

NAMTAB – it is used to store the macro names and it contains two

pointers for each macro instruction which indicate the starting and end location of macro definition in DEFTAB. it also serves as an index to DEFTAB

ARGTAB – it is used to store the arguments during the expansion of macro invocations.

5. Define conditional macro expansion.

If the macro is expanded depends upon some conditions in macro

definition (depending on the arguments supplied in the macro expansion) then it is called as conditional macro expansion.

6. What is the use of macro time variable?

Macro time variable can be used to store working values during the macro expansion. Any symbol that begins with the character & and then is not a macro instruction parameter is assumed to be a macro time variable.

7. What are the statements used for conditional macro expansion?

IF-ELSE-ENDIF statement

WHILE-ENDW statement

8. What is meant by positional parameters?

If the parameters and arguments were associated with each other

according to their positions in the macro prototype and the macro invocation statement, then these parameters in macro definitions are called as positional parameters.

9. Consider the macro definition

#define DISPLAY (EXPR) Printf (“EXPR = %d\n”, EXPR)
Expand the macro instruction DISPLAY (ANS)

Ans.: Printf (“EXPR = %d\n”, ANS)

10. What are known as nested macro call?

The statement, in which a macro calls on another macro, is called nested macro call. In the nested macro call, the call is done by outer macro and the macro called is the inner macro.

11. How the macro is processed using two passes?

Pass1: processing of definitions

Pass2:actual-macro expansion.

12. Give the advantage of line by line processors.

It avoids the extra pass over the source program during assembling.

It may use some of the utility that can be used by language translators so that can be loaded once.

13. What is meant by line by line processor?

This macro processor reads the source program statements, process the

statements and then the output lines are passed to the language translators as they are generated, instead of being written in an expanded file.

14. Give the advantages of general-purpose macro processors.

The programmer does not need to learn about a macro facility for each compiler.

Overall saving in software development cost and maintenance cost.

15. What is meant by general-purpose macro processors?

The macro processors that are not dependent on any particular

programming language, but can be used with a variety of different languages are known as general purpose macro processors.

Eg. The ELENA macro processor.

16. What are the important factors considered while designing general purpose macro processors?

• comments

• grouping of statements

• tokens

• syntax used for macro definitions

17. What is the symbol used to generate unique labels?

$ symbol is used in macro definition to generate unique symbols. Each

macro expansion the $ symbol is replaced by $XX, where XX is the alpha

numeric character.

18. How the nested macro calls are executed?

The execution of nested macro call follows the LIFO rule. In case of nested macro calls the expansion of the latest macro call is completed first.

19. Mention the tasks involved in macro expansion.

identify the macro calls in the program

the values of formal parameters are identified

maintain the values of expansion time variables declared in a macro

expansion time control flow is organized

determining the values of sequencing symbols

expansion of a model statement is performed

20. How to design the pass structure of a macro assembler?

To design the structure of macro-assembler, the functions of macro

preprocessor and the conventional assembler are merged. After merging, the functions are structured into passes of the macro assembler.

TEXT EDITORS ::

1. Define interactive editor?

An interactive editor is a computer program that allows a user to create and revise a target document. The term document includes objects such as computer programs, text, equations, tables, diagrams, line art, and photographs any thing that one might find on a printed page.

2. What are the tasks performed in the editing process?

4 tasks

Select the part of the target document to be viewed and manipulated.

Determine how to format this view on-line and how to display it.

Specify and execute operations that modify the target document.

Update the view appropriately.

3. What are the three categories of editor's devices?

Text device/ String devices

Button device/Choice devices

Locator device

4. What is the function performed in editing phase?

In the actual editing phase, the target document is created or altered with a set of operations such as insert, delete, replace, move and copy.

5. Define Locator device?

Locator devices are two-dimensional analog-to-digital converters that

position a cursor symbol on the screen by observing the user's movement of the device. The most common such devices for editing applications are the mouse and the data tablet.

6. What is the function performed in voice input device?

Voice-input devices, which translate spoken words to their textual

equivalents, may prove to be the text input devices of the future. Voice recognizers are currently available for command input on some systems.

7. What are called tokens?

The lexical analyzer tracks the source program one character at a time by making the source program into sequence of atomic units is called tokens.

8. Name some of typical tokens.

Identifiers, keywords, constants, operators and punctuation symbols such as commas and parentheses are typical tokens.

9. What is meant by lexeme?

The character that forms a token is said to be a lexeme.

10. Mention the main disadvantage of interpreter.

The main disadvantage of interpreter is that the execution time of

interpreted program is slower than that of a corresponding compiled object program.

11. What is meant by code optimization?

The code optimization is designed to improve the intermediate code,

which helps the object program to run faster and takes less space.

12. What is error handler?

The error handler is used to check if there is an error in the program. If any error, it should warn the programmer by instructions to proceed from phase to phase.

13. Name some of text editors.

line editors

stream editors

screen editors

word processors

structure editors

14. What for debug monitors are used?

Debug monitors are used in obtaining information for localization of

errors.

15. Mention the features of word processors.

moving text from one place to another

merging of text

searching

word replacement

16. What are the phases in performing editing process?

Traveling phase

Filtering phase

Formatting phase

Editing phase

17. Define traveling phase.

The phase specifies the region of interest. Traveling is achieved using operations such as next screenful, bottom, find pattern.

18. Filtering phase.

The selection of what is to be viewed and manipulated in given by

filtering.

19. Editing phase

In this phase, the target document is altered with the set of operations such as insert, delete, replace, move and copy.

20. Define user interface?

User interface is one, which allows the user to communicate with the

system in order to perform certain tasks. User interface is generally designed in a computer to make it easier to use.

21. Define input device?

Input device is an electromechanical device, which accepts data from the outside world and translates them into a form, which the computer can interpret.

22.Define output devices

Output devices the user to view the elements being edited and the results of the editing operations.

23. What are the methods in Interaction language of a text editor?

Typing –oriented or text command oriented method

Function key interfaces

menu oriented method

24. Define interactive debugging systems.

An interactive debugging system provides programmers with facilities

that aid in the testing and debugging of programs.

Debugging functions and capabilities

Relationship with other parts of the system

User interface criteria.

25. Define editor structure.

The command language processor accepts input from the users input

devices and analyzes the tokens and syntactic structure of the commands.

26. Give the components of editor structure 4 components

Editing component

Traveling component

Viewing component

Display component

27. What are the basic types of computing environments used in editor's functions?

Editor's function in three basic types of computing environments

Time sharing

Stand-alone

Distributed

1. Define lex and yacc tools

Lex:- scanner that can identify those tokens

Yacc:- parser.yacc takes a concise description of a grammar and produces a C routine that can parse that grammar.

2. Give the structure of the lex program

Definition section- any intitial 'c' program code % %

Rules section- pattern and action separated by white space %%

User subroutines section-concsit of any legal code.

3. The lexer produced by lex in a 'c' routine is called yylex()

4. Explain yytext?

contains the text that matched the pattern.

5. The yacc produced by parser is called yyparse().

6. Why we have to include 'y.tab.h' in lex?

y.tab.h contains token definitions eg:- #define letter 258.

7. Explain the structure of a yacc program?

Defn section- declarations of the tokens used in the grammar %%

The rules section-pattern action %%

Users subroutines section

8. Explain yyleng?

Yyleng-contains the length of the string our lexer recognizes.

9. Features of unix

multitasking,mutiuser,online help facility,security,file & process.

10. What is an internal command?give an example?

Command which is shell built-in eg:echo

11. What is an external command?give a example?

Command which resides in other directories-eg:cd in /bin

12. What is an absolute path name?give an example?

A file name identification with respect to the root. Eg:-/home/kumar/f1

13. Differentiate the commands cp and mv?

Cp- copy the files

mv- renaming the file.

14. Explain mkdir command?

Used to create a directory

Eg:mkdir m1,m2

15. What are tokens or terminal symbols?

Symbols that appear in the input are returned by the lexer are terminal symbols.

SYSTEM Programming Viva Questions ::

16. What type of data structures is used by shift/reduce parsing?

Stack.

17. Shell- it is a command interpreter

kernel- is the core of the operating system.

18. What is lexical analyzer?

Lex taking a set of descriptions of possible tokensand producing a ‘C” routine is called a lexical analyzer (or) lexer (or) scanner.

19. Define grammer?

The list of rules that define the relationship that the program understands is a grammar.

20. What is symbol table?

The table of words is a simple symbol table,a common structure in lex and yacc applications.

21. What is pseudo token

A pseudo token standing for unary minus, has no associativity is at the highest precedence.

22. What does $$ represents?

$$ represents the value of the left hand side.

23. What are shell scripts?

Using a program, we can run more than one command.

24. What is the usage of grep command?

Grep command is used to search a pattern in a database.

25. What is exit status command?

Exit 0- return success,command executed successfully.

Exit 1 – return failure.

26. What are daemons?

They are one system processes

27. Uname

tells you the name of the unix system you are using.

28. Umask

tells unix which permissions to give to files and directories you create.

29. tty

displays the device name of your terminal

30. Vi editor

(visual editor)- used to write programs.

31. $ls-l

lists the attributes of a file.

32. What is an relative path name?

A file identification not with respect to the root.