Overview of Process Management

1) Describe the objective of multiprogramming.

The main objective of multiprogramming is to have process running at all times. With this design, CPU utilization is said to be maximized (CareerGuru, 2015).

2) Give some benefits of multithreaded programming.

– there is an increased responsiveness to the user
– resource sharing within the process
– economy
– utilization of multiprocessing architecture (CareerGuru, 2015)

3) What is a thread?

A thread is a basic unit of CPU utilization. In general, a thread is composed of a thread ID, program counter, register set and the stack (CareerGuru, 2015).

4) Explain the meaning of mutex.

Mutex is the short form for 'Mutual Exclusion object'. A mutex allows multiple threads for sharing the same resource. The resource can be file. A mutex with a unique name is created at the time of starting a program. A mutex must be locked from other threads, when any thread that needs the resource. When the data is no longer used / needed, the mutex is set to unlock (Freshersworld, 2015).

5) Explain the popular multiprocessor thread-scheduling strategies.

1. **Load Sharing**: Processes are not assigned to a particular processor. A global queue of threads is maintained. Each processor, when idle, selects a thread from this queue. Note that load balancing refers to a scheme where work is allocated to processors on a more permanent basis.
2. **Gang Scheduling**: A set of related threads is scheduled to run on a set of processors at the same time, on a 1-to-1 basis. Closely related threads / processes may be scheduled this way to reduce synchronization blocking, and minimize process switching. Group scheduling predated this strategy.
3. **Dedicated processor assignment**: Provides implicit scheduling defined by assignment of threads to processors. For the duration of program execution, each program is allocated a set of processors equal in number to the number of threads in the program. Processors are chosen from the available pool.
4. **Dynamic scheduling**: The number of thread in a program can be altered during the course of execution (IndiaBIX, 2015).

6) What is a process?

A program in execution is called a process.

Processes are of two types:
1. Operating system processes
2. User processes (Freshersworld, 2015)

7) Give an example of a Process State.

– **New State** – means a process is being created
– **Running** – means instructions are being executed
– **Waiting** – means a process is waiting for certain conditions or events to occur
– **Ready** – means a process is waiting for an instruction from the main processor
– **Terminate** – means a process is done executing (CareerGuru, 2015)

8) List out some reasons for process termination.

1. Normal completion
2. Time limit exceeded
3. Memory unavailable
4. Bounds violation
5. Protection error
6. Arithmetic error
7. Time overrun
8. I/O failure
9. Invalid instruction
10. Privileged instruction
11. Data misuse
12. Operator or OS intervention
13. Parent termination (IndiaBIX, 2015)

9) What are the reasons for process suspension?

1. swapping
2. interactive user request
3. timing
4. parent process request (IndiaBIX, 2015)

10) What is a long term scheduler & short term schedulers?

Long term schedulers are the job schedulers that select processes from the job queue and load them into memory for execution. The short term schedulers are the CPU schedulers that select a process from the ready queue and allocate the CPU to one of them (Freshersworld, 2015).

11) What is Dispatcher?

Dispatcher module gives control of the CPU to the process selected by the short-term scheduler; this involves: Switching context, Switching to user mode, Jumping to the proper location in the user program to restart that program, dispatch latency – time it takes for the dispatcher to stop one process and start another running (Freshersworld, 2015).

12. What is an idle thread?

The special thread a dispatcher will execute when no ready thread is found (IndiaBIX, 2015).

13) Briefly explain FCFS.

FCFS is short for First-come, first-served, and is one type of scheduling algorithm. In this scheme, the process that requests the CPU first is allocated the CPU first. Implementation is managed by a FIFO queue (CareerGuru, 2015).

14) What is RR scheduling algorithm?

RR (round-robin) scheduling algorithm is primarily aimed for time-sharing systems. A circular queue is setup in such a way that the CPU scheduler goes around that queue, allocating CPU to each process for a time interval of up to around 10 to 100 milliseconds (CareerGuru, 2015).

15) What necessary conditions can lead to a deadlock situation in a system?

Deadlock situations occur when four conditions occur simultaneously in a system: Mutual exclusion; Hold and Wait; No preemption; and Circular wait (CareerGuru, 2015).

15b) List the Coffman's conditions that lead to a deadlock.

1. Mutual Exclusion: Only one process may use a critical resource at a time.

2. Hold & Wait: A process may be allocated some resources while waiting for others.

3. No Pre-emption: No resource can be forcible removed from a process holding it.

4. Circular Wait: A closed chain of processes exist such that each process holds at least one resource needed by another process in the chain (IndiaBIX, 2015).

16) What is dead lock?

Deadlock is a situation or condition where the two processes are waiting for each other to complete so that they can start. This result both the processes to hang.

17) What are necessary conditions for dead lock?

1. Mutual exclusion (where at least one resource is non-sharable)

2. Hold and wait (where a process holds one resource and waits for other resource)

3. No preemption (where the resources can't be preempted)

4. Circular wait (where p[i] is waiting for p[j] to release a resource. i= 1,2,…n

j=if (i!=n) then i+1

(Freshersworld, 2015)

18) Describe Banker's algorithm

Banker's algorithm is one form of deadlock-avoidance in a system. It gets its name from a banking system wherein the bank never allocates available cash in such a way that it can no longer satisfy the needs of all of its customers (CareerGuru, 2015).

19) What factors determine whether a detection-algorithm must be utilized in a deadlock avoidance system?

One is that it depends on how often a deadlock is likely to occur under the implementation of this algorithm. The other has to do with how many processes will be affected by deadlock when this algorithm is applied (CareerGuru, 2015).

20) What is process synchronization?

A situation, where several processes access and manipulate the same data concurrently and the outcome of the execution depends on the particular order in which the access takes place, is called race condition. To guard against the race condition we need to ensure that only one process at a time can be manipulating the same data. The technique we use for this is called process synchronization (Freshersworld, 2015).

21) When is a system in safe state?

The set of dispatchable processes is in a safe state if there exists at least one temporal order in which all processes can be run to completion without resulting in a deadlock (Freshersworld, 2015).

22) What is context switching?

Transferring the control from one process to other process requires saving the state of the old process and loading the saved state for new process. This task is known as context switching (Freshersworld, 2015).

23) What is process migration?

It is the transfer of sufficient amount of the state of process from one machine to the target machine (Freshersworld, 2015).

24) What are the possible threads a thread can have?

1. Ready
2. Standby
3. Running
4. Waiting
5. Transition
6. Terminated (IndiaBIX, 2015)

24) What is process migration?

It is the transfer of sufficient amount of the state of process from one machine to the target machine (IndiaBIX, 2015).

25) What is SMP?

To achieve maximum efficiency and reliability a mode of operation known as symmetric multiprocessing is used. In essence, with SMP any process or threads can be assigned to any processor (IndiaBIX, 2015).

26) What is a socket?

A socket provides a connection between two applications. Each endpoint of a communication is a socket (CareerGuru, 2015).

27) When does the condition 'rendezvous' arise?

In message passing, it is the condition in which, both, the sender and receiver are blocked until the message is delivered (IndiaBIX, 2015).

Overview of Operating Systems

1) What is an operating system?

An operating system is a program that acts as an intermediary between the user and the computer hardware. The purpose of an OS is to provide a convenient environment in which user can execute programs in a convenient and efficient manner (Freshersworld, 2015).

2) What are the basic functions of an operating system?

Operating system controls and coordinates the use of the hardware among the various applications programs for various uses. Operating system acts as resource allocator and manager. Also operating system is control program which controls the user programs to prevent errors and improper use of the computer. It is especially concerned with the operation and control of I/O devices (Freshersworld, 2015).

3) What are the different operating systems?

- Batched operating systems
- Multi-programmed OS
- Timesharing OS
- Distributed OS
- Real-time OS (IndiaBIX, 2015)

4) Explain the concept of the batched operating systems?

In batched operating system the users gives their jobs to the operator who sorts the programs according to their requirements and executes them. This is time consuming but makes the CPU busy all the time (Freshersworld, 2015).

5) What has triggered the need for multitasking in PCs?

1. Increased speed and memory capacity of microprocessors together with the support fir virtual memory and
2. Growth of client server computing (IndiaBIX, 2015)

6) What is kernel?

Kernel is the core of every operating system. It connects applications to the actual processing of data. It also manages all communications between software and hardware components to ensure usability and reliability (CareerGuru, 2015).

7) What is difference between micro kernel and macro kernel?

Micro kernel is a kernel which run services those are minimal for operating system performance. In this kernel all other operations are performed by processor.

Macro Kernel is a combination of micro and monolithic kernel. In monolithic kernel all operating system code is in single executable image (Freshersworld, 2015).

8) What is dual-mode operation?

In order to protect the operating systems and the system programs from the malfunctioning programs the two mode operations were evolved
System mode
User mode (Freshersworld, 2015).

9) What are real-time systems?

Real-time systems are used when rigid time requirements have been placed on the operation of a processor. It has well defined and fixed time constraints (CareerGuru, 2015).

10) What are the different types of Real-Time Scheduling?

Hard real-time systems required to complete a critical task within a guaranteed amount of time.
Soft real-time computing requires that critical processes receive priority over less fortunate ones (Freshersworld, 2015).

11) What are time sharing systems?

In a Time sharing system, the CPU executes multiple jobs by switching among them, also known as multitasking. This process happens so fast that users can actually interact with each program while it is running (CareerGuru, 2015).

12) How are server systems classified?

Server systems can be classified as either computer-server systems or file server systems. In the first case, an interface is made available for clients to send requests to perform an action. In the second case, provisions are available for clients to create, access and update files (CareerGuru, 2015).

13) What are the advantages of a multiprocessor system?

With an increased number of processors, there is considerable increase in throughput. It can also save more money because they can share resources. Finally, overall reliability is increased as well (CareerGuru, 2015).

14) Difference between Primary storage and secondary storage?

Primary memory is the main memory (Hard disk, RAM) where the operating system resides.

Secondary memory can be external devices like CD, floppy magnetic discs etc. secondary storage cannot be directly accessed by the CPU and is also external memory storage (Freshersworld, 2015).

15) What is a data register and address register?

Data registers - can be assigned to a variety of functions by the programmer. They can be used with any machine instruction that performs operations on data.
Address registers - contain main memory addresses of data and instructions or they contain a portion of the address that is used in the calculation of the complete addresses (Freshersworld, 2015).

16) What is DRAM?

Dynamic Ram stores the data in the form of Capacitance, and Static RAM stores the data in Voltages. (Freshersworld, 2015)

17) What is cache memory?

Cache memory is random access memory (RAM) that a computer microprocessor can access more quickly than it can access regular RAM. As the microprocessor processes data, it looks first in the cache memory and if it finds the data there (from a previous reading of data), it does not have to do the more time-consuming reading of data from larger memory (Freshersworld, 2015).

18) What is cache-coherency?

In a multiprocessor system there exist several caches each may containing a copy of same variable A. Then a change in one cache should immediately be reflected in all other caches this process of maintaining the same value of a data in all the caches s called cache-coherency (Freshersworld, 2015).

19) What is logical and physical addresses space?

Logical address space is generated from CPU; it bound to a separate physical address space is central to proper memory management. Physical address space is seen by the memory unit. Logical address space is virtual address space. Both these address space will be same at compile time but differ at execution time (Freshersworld, 2015).

20) Differentiate between Complier and Interpreter?

An interpreter reads one instruction at a time and carries out the actions implied by that instruction. It does not perform any translation. But a compiler translates the entire instructions (Freshersworld, 2015)

21) What are device drivers?

Device drivers provides a standard means of representing I/O devices that maybe manufactured by different companies. This prevents conflicts whenever such devices are incorporated in a systems unit (CareerGuru, 2015).

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

Typically, the different attributes for a file structure are naming, identifier, supported file types, and

location for the files, size, and level of protection (CareerGuru, 2015).

23) What is root partition?

Root partition is where the operating system kernel is located. It also contains other potentially

important system files that are mounted during boot time (CareerGuru, 2015).

24) What is a trap and trapdoor?

Trapdoor is a secret undocumented entry point into a program used to grant access without normal methods of access authentication. A trap is a software interrupt, usually the result of an error condition (IndiaBIX, 2015).

25) Explain the concept of Reentrancy?

It is a useful, memory-saving technique for multiprogrammed timesharing systems. A Reentrant Procedure is one in which multiple users can share a single copy of a program during the same period. Reentrancy has 2 key aspects: The program code cannot modify itself, and the local data for each user process must be stored separately. Thus, the permanent part is the code, and the temporary part is the pointer back to the calling program and local variables used by that program. Each execution instance is called activation. It executes the code in the permanent part, but has its own copy of local variables/parameters. The temporary part associated with each activation is the activation record. Generally, the activation record is kept on the stack.

Note: A reentrant procedure can be interrupted and called by an interrupting program, and still execute correctly on returning to the procedure (IndiaBIX, 2015).

Memory Management

1) What is virtual memory?

Virtual memory is a memory management technique for letting processes execute outside of memory. This is very useful especially is an executing program cannot fit in the physical memory (CareerGuru, 2015).

2) What is fragmentation?

Fragmentation is memory wasted. It can be internal if we are dealing with systems that have fixed-sized allocation units, or external if we are dealing with systems that have variable-sized allocation units (CareerGuru, 2015).

3) What is fragmentation? Tell about different types of fragmentation?

When many of free blocks are too small to satisfy any request then fragmentation occurs. External fragmentation and internal fragmentation are two types of fragmentation. External Fragmentation happens when a dynamic memory allocation algorithm allocates some memory and a small piece is left over that cannot be effectively used. Internal fragmentation is the space wasted inside of allocated memory blocks because of restriction on the allowed sizes of allocated blocks (Freshersworld, 2015).

4) What is Memory-Management Unit (MMU)?

Hardware device that maps virtual to physical address. In MMU scheme, the value in the relocation register is added to every address generated by a user process at the time it is sent to memory.

->The user program deals with logical addresses; it never sees the real physical addresses (Freshersworld, 2015)

5) How does swapping result in better memory management?

During regular intervals that are set by the operating system, processes can be copied from main memory to a backing store, and then copied back later. Swapping allows more processes to be run that can fit into memory at one time (CareerGuru, 2015).

6) What is Direct Access Method?

Direct Access method is based on a disk model of a file, such that it is viewed as a numbered sequence of blocks or records. It allows arbitrary blocks to be read or written. Direct access is advantageous when accessing large amounts of information (CareerGuru, 2015).

7) What is cycle stealing?

We encounter cycle stealing in the context of Direct Memory Access (DMA). Either the DMA controller can use the data bus when the CPU does not need it, or it may force the CPU to temporarily suspend operation. The latter technique is called cycle stealing. Note that cycle stealing can be done only at specific break points in an instruction cycle (IndiaBIX, 2015).

8) What are overlays?

Overlays are used to enable a process to be larger than the amount of memory allocated to it. The basic idea of this is that only instructions and data that are needed at any given time are kept in memory (CareerGuru, 2015).

9) Differentiate logical from physical address space.

Logical address refers to the address that is generated by the CPU. On the other hand, physical address refers to the address that is seen by the memory unit (CareerGuru, 2015).

10) How does dynamic loading aid in better memory space utilization?

With dynamic loading, a routine is not loaded until it is called. This method is especially useful when large amounts of code are needed in order to handle infrequently occurring cases such as error routines (CareerGuru, 2015).

11) What is the basic function of paging?

Paging is a memory management scheme that permits the physical-address space of a process to be noncontiguous. It avoids the considerable problem of having to fit varied sized memory chunks onto the backing store (CareerGuru, 2015).

12) When does thrashing occur?

Thrashing refers to an instance of high paging activity. This happens when it is spending more time paging instead of executing (CareerGuru, 2015).

13) What is demand paging?

Demand paging is a system wherein area of memory that are not currently being used are swapped to disk to make room for an application's need (CareerGuru, 2015).

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

The best paging size varies from system to system, so there is no single best when it comes to page size. There are different factors to consider in order to come up with a suitable page size, such as page table, paging time, and its effect on the overall efficiency of the operating system (CareerGuru, 2015).

15) What is page cannibalizing?

Page swapping or page replacements are called page cannibalizing (Freshersworld, 2015).

16) What are demand-paging and pre-paging?

With demand paging, a page is brought into memory only when a location on that page is actually referenced during execution. With pre-paging, pages other than the one demanded by a page fault are brought in. The selection of such pages is done based on common access patterns, especially for secondary memory devices (IndiaBIX, 2015).

17) Paging a memory management function, while multiprogramming a processor management function, are the two interdependent?

Yes (IndiaBIX, 2015).

18) In the context of memory management, what are placement and replacement algorithms?

Placement algorithms determine where in available real-memory to load a program. Common methods are first-fit, next-fit, best-fit. Replacement algorithms are used when memory is full, and one process (or part of a process) needs to be swapped out to accommodate a new program. The replacement algorithm determines which the partitions to be swapped out are.

19) Define latency, transfer and seek time with respect to disk I/O.

Seek time is the time required to move the disk arm to the required track. Rotational delay or latency is the time it takes for the beginning of the required sector to reach the head. Sum of seek time (if any) and latency is the access time. Time taken to actually transfer a span of data is transfer time (IndiaBIX, 2015).

20) In loading programs into memory, what is the difference between load-time dynamic linking and run-time dynamic linking?

For load-time dynamic linking: Load module to be loaded is read into memory. Any reference to a target external module causes that module to be loaded and the references are updated to a relative address from the start base address of the application module.

With run-time dynamic loading: Some of the linking is postponed until actual reference during execution. Then the correct module is loaded and linked (IndiaBIX, 2015).

References

CareerGuru. (2015). Top 50 Operating Systems Interview Questions. Retrieved from CareerGuru: http://career.guru99.com/top-50-operating-system-interview-questions/

Freshersworld. (2015). Freshersworld. Retrieved from Freshersworld: http://placement.freshersworld.com/power-preparation/technical-interview-preparation/os-interview-questions-23351

IndiaBIX. (2015). IndiaBIX. Retrieved from Operating Systems - Interview Questions: http://www.indiabix.com/technical/operating-systems/