



# MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.



**MUST KNOW CONCEPTS**

**MKC**

**AI&DS**

**2021-2022**

**Course Code & Course Name : 19ADC07&OPERATING SYSTEMS**

**Year/Sem/Sec : III/II**

S.No.	Term	Notation (Symbol)	Concept / Definition / Meaning / Units / Equation / Expression	Units
<b>Unit-I : Operating Systems Overview</b>				
1.	Operating System		<ul style="list-style-type: none"><li>• It is a software that works as an interface between a user and the computer hardware.</li><li>• The primary objective of an operating system is to make computer system convenient to use and to utilize computer hardware in an efficient manner.</li></ul>	
2.	Types of Operating systems		<ul style="list-style-type: none"><li>• Batched</li><li>• Multiprogrammed</li><li>• Timesharing</li><li>• Distributed</li><li>• Real Time</li></ul>	
3.	Kernel		Kernel is the core and essential part of computer operating system that provides basic services for all parts of OS.	
4.	Process(Types)		Program in execution(OS Process and User Process)	
5.	States of a Process		New,Running,Waiting,Ready,Terminated	
6.	The main functions of an OS		a.Process Management b. Memory Management c. Input/ Output Management d. Storage/ File system management	
7.	The main functions of a Kernel		Process management - Device management - Memory management - Interrupt handling	

			<ul style="list-style-type: none"> <li>- I/O communication</li> <li>- File system management</li> </ul>	
8.	daemon		Disk and execution monitor, is a process that runs in the background without user's interaction. They usually start at the booting time and terminate when the system is shut down.	
9.	Mainframe Systems		<ul style="list-style-type: none"> <li>• Mainframe systems are the first computers developed to tackle many commercial and scientific applications.</li> <li>• These systems are developed from the batch systems and then multiprogramming system and finally time sharing systems.</li> </ul>	
10.	Batch Systems		<ul style="list-style-type: none"> <li>• Operators batched together jobs with similar needs and ran through the computer as a group .</li> <li>• The operators would sort programs into batches with similar requirements and as system become available, it would run each batch.</li> </ul>	
11.	Components of a Computer System		<ol style="list-style-type: none"> <li>1. Application Programs</li> <li>2. System Program</li> <li>3. Operating System</li> <li>4. Computer Hardware</li> </ol>	
12.	Advantages of Multiprogramming		<ul style="list-style-type: none"> <li>• Increased System Throughput</li> <li>• Increased CPU utilization</li> </ul>	
13.	Multiprocessor System		Multiprocessor systems have systems more than one processor for communication, sharing the computer bus, the memory, clock & peripheral devices	
14.	clustered system		Clustered systems are collection of multiple CPUs to accomplish computational work. Those systems share storage and are closely linked via LAN networking.	
15.	types of clustering		<ul style="list-style-type: none"> <li>• Asymmetric Clustering</li> <li>• Symmetric Clustering</li> </ul>	

			<ul style="list-style-type: none"> <li>Clustering over a WAN</li> </ul>	
16.	Asymmetric Clustering		In this clustering, one machine is in hot standby mode, while the other is running the application. The hot standby machine just monitors the active server. If that server fails, hot standby host become the active server	
17.	System Libraries		System Libraries define a standard set of functions through which applications can interact with the kernel and that implement much of the operating -system functionality that doesn't need the full privileges of kernel code.	
18.	System Utilities		System Utilities are system programs that perform individual, specialized management tasks. Some of the System utilities may be invoked just to initialize and configure some aspect of the system and others may run permanently, handling such tasks as responding to incoming network connections, accepting logon requests from terminals or updating log files.	
19.	function of Module management		The module management allows modules to be loaded into memory and to talk to the rest of the kernel.	
20.	Kernel in Linux system		Kernel is responsible for maintaining all the important abstractions of the operating system including such things as virtual memory and processes.	
21.	Personality		Process Personalities are primarily used by emulation libraries to request that system call be compatible with certain versions of UNIX	
22.	Main support for the Linux modules ?.		The Module support under Linux has three components.They are : (i). Module Management (ii)Driver Registration (iii)Conflict Resolution mechanism.	
23.	Components of a Linux System		?Linux System composed of three main modules.They are : (i).Kernel (ii).System libraries (iii).System utilities	
24.	Boot Disk		A Disk that has a boot partition is called as Boot Disk.	

25.	Data Striping		Data Striping means splitting the bits of each byte across multiple disks .It is also called as Bit -level Striping	
<b>Unit-II : Threads And Scheduling Algorithms</b>				
26.	Turnaround Time		Amount of time to execute a particular process	
27.	Waiting Time		Amount of time a process has been waiting in the ready queue	
28.	Response Time		Amount of time it takes from when a request was submitted until the first response is produced, not output (for time-sharing environment)	
29.	Real-time Systems		A real time process is a process that must respond to the events within a certain time period. A real time operating system is an operating system that can run real time processes successfully	
30.	Long-term Scheduler		Long term schedulers are the job schedulers that select processes from the job queue and load them into memory for execution.	
31.	Short-term Scheduler		The short term schedulers are the CPU schedulers that select a process from the ready queue and allocate the CPU to one of them.	
32.	Compaction		Compaction is a process in which the free space is collected in a large memory chunk to make some space available for processes.	
33.	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.	
34.	Starvation		Starvation is Resource management problem where a process does not get the resources it needs for a long time because the resources are being allocated to other processes.	
35.	System calls		A system call is the programmatic way in which a computer program requests a service from the kernel of the operating system	
36.	Process Synchronization		Process Synchronization means sharing system resources by processes in such a way that, Concurrent access to shared data is	

			handled thereby minimizing the chance of inconsistent data.	
37.	context switching		Context is associated with each process encompassing all the information describing the current execution state of the process	
38.	Non-Preemptive algorithms.		In this type of scheduling once a CPU has been allocated to a process it would not release the CPU till a request for termination or switching to waiting state occurs	
39.	Preemptive algorithms		In this type of scheduling a process maybe interrupted during execution and the CPU maybe allocated to another process.	
40.	Multithreading		Multithreading is a process of executing more than one thread simultaneously	
41.	LiveLock		Livelock occurs when all threads are blocked and not able to execute because of the unavailability of required resources, and non-existence of any unblocked thread.	
42.	Monitor		<ul style="list-style-type: none"> <li>• The monitor is a body of code that can be executed by only one thread at a time.</li> <li>• If any other thread attempts to get access at the same time, it will be suspended until the current thread releases the Monitor</li> </ul>	
43.	ThreadPool		ThreadPool is a pool of threads that reuses a fixed number of threads to execute the specific task	
44.	volatile keyword		Volatile keyword is a qualifier which is applied to a variable when it is declared. It tells the compiler that the value of the variable may change at any time—without any action being taken by the code	
45.	3 different types of scheduling queues		<p>Job Queue: As process enters the system they are put into job queue.</p> <p>Ready Queue: The processes that are residing in the main memory and are ready and waiting to execute are kept in the queue</p> <p>Device Queue: The list of processes waiting for particular I/O device is called a device queue.</p>	

46.	the benefits of multithreaded programming		<p>Responsiveness</p> <p>Resource sharing</p> <p>Economy</p> <p>Utilization of multiprocessor architecture</p>	
47.	critical section problem		<p>Consider a system consists of 'n' processes. Each process has segment of Code called a critical section, in which the process may be changing common variables, updating a table, writing a file. When one process is executing in its critical section, no other process can allowed to execute in its critical section</p>	
48.	busy waiting and spinlock		<ul style="list-style-type: none"> <li>✓ When a process is in its critical section, any other process that tries to enter its critical section must loop continuously in the entry code.</li> <li>✓ This is called as busy waiting and this type of semaphore is also called a spinlock, because the process while waiting for the lock</li> </ul>	
49.	Entry section		<p>The critical section problem is to design a protocol that the processes can use to cooperate.</p> <p>Each process must request permission to enter its critical section.</p>	
50.	Exit section		<p>The critical section is followed by an exit section. The remaining code is the remainder section</p>	
<b>Unit-III : Memory Management</b>				
51.	Virtual Memory		<p>Virtual memory is hardware technique where the system appears to have more memory that it actually does. This is done by time-sharing, the physical memory and storage parts of the memory one disk when they are not actively being used.</p>	
52.	Thrashing		<p>It is a phenomenon in virtual memory schemes when the processor spends most of its time swapping pages, rather than executing instructions. This is due to an inordinate number of page faults.</p>	
53.	Logical Address Space		<p>Logical address space is generated from CPU; it bound to a separate physical address space</p>	

			is central to proper memory management	
54.	Physical Address Space		Physical address space is seen by time. the memory unit. Logical address space is virtual address space. Both these address space will be same at compile time but differ at execution.	
55.	Throughput		Number of processes that complete their execution per time unit	
56.	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.	
57.	Belady's Anomaly		Belady's anomaly is an anomaly with some page replacement policies where increasing the number of page frames results in an increase in the number of page faults. It occurs with First in First Out page replacement is used.	
58.	Paging		Paging is used to solve the external fragmentation problem in operating system. This technique ensures that the data we need is available as quickly as possible.	
59.	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.	
60.	page frames		Page frames are the fixed size contiguous areas into which the main memory is divided by the virtual memory.	
61.	Banker's Algorithm		Banker's algorithm is used to avoid deadlock. It is the one of deadlock-avoidance method.	
62.	Swapping		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.	
63.	Segmentation		The chunks that a program is divided into which are not necessarily all of the same sizes are called segments.	
64.	Semaphore		Semaphore is a variable, whose status reports common resource, Semaphore is of two types	

			one is Binary semaphore and other is Counting semaphore.	
65.	Thread		A thread is a program line under execution. Thread sometimes called a light-weight process, is a basic unit of CPU utilization; it comprises a thread id, a program counter, a register set, and a stack	
66.	Conditions for Deadlock		Mutual exclusion, No preemption, Hold and Wait, Circular Wait	
67.	Critical Section		Critical section is a code segment that can be accessed by only one process at a time. Critical section contains shared variables which need to be synchronized to maintain consistency of data variables.	
68.	Race Condition		A race condition is a situation that may occur inside a critical section	
69.	Mutual Exclusion		The resources available are not sharable. This implies that the resources used must be mutually exclusive.	
70.	Hold and Wait		Any process requires some resources in order to be executed. In case of insufficient availability of resources a process can take the available resources, hold them and wait for more resources to be available	
71.	No Preemption		The resources that a process has on hold can only be released by the process itself voluntarily. This resource cannot be preempted by the system.	
72.	Safe State		A state is safe if the system allocates resources to each process in some order and still avoid deadlock.	
73.	Page Fault		A page fault happens when a running program accesses a memory page that is mapped into the virtual address space, but not loaded in physical memory.	
74.	deadlock-avoidance algorithm		<ul style="list-style-type: none"> <li>✓ A deadlock-avoidance algorithm dynamically examines the resource allocation state to ensure that a circular wait condition can never exist.</li> <li>✓ The resource allocation state is defined by the number of available and allocated resources, and the</li> </ul>	



			maximum demand of the processes	
75.	Binary Semaphore		A Binary Semaphore is a semaphore with an integer value that can range between 0 and 1. It can be simpler to implement than a counting semaphore, depending on the underlying hardware architecture.	
<b>Unit-IV : Storage And File Management</b>				
76.	Disk Scheduling		The technique that operating system uses to determine the request which is to be satisfied next is called disk scheduling.	
77.	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.	
78.	Free Space Management		The system keeps tracks of the free disk blocks for allocating space to files when they are created.	
79.	Seek Time		Seek time is the time taken for a hard disk controller to locate a specific piece of stored data.	
80.	Latency Time		Latency is the time it takes for the beginning of the required sector to reach the head.	
81.	Cache Memory		Cache Memory is a special very high-speed memory. It is used to speed up and synchronizing with high-speed CPU	
82.	Compaction		Compaction means movement of these pieces close to each other to form a larger chunk of memory which works as a resource to run larger processes	
83.	Socket		A socket provides a connection between two applications. Each endpoint of a communication is a socket.	
84.	Unit of transfer		Data may be transferred as a stream of bytes or characters or in larger blocks	
85.	Log structured file		Log structured file is used for file system meta data updates	
86.	Garbage collection		It is the process of automatically freeing objects that are no longer referenced by the program	
87.	Various IPC mechanisms		a. Sockets b. Pipes c. Shared memory d. Signals	

			e. Message Queues	
88.	The various File Operation		<ul style="list-style-type: none"> <li>• Creating a file</li> <li>• Writing a file</li> <li>• Reading a file</li> <li>• Repositioning within a file</li> <li>• Deleting a file</li> <li>• Truncating</li> </ul>	
89.	Directory		The device directory or simply known as directory records information- such as name, location, size, and type for all files on that particular partition. The directory can be viewed as a symbol table that translates file names into their directory entries	
90.	various logical structures of a Directory		<ul style="list-style-type: none"> <li>• Single-level Directory</li> <li>• Two-level Directory</li> <li>• Tree Structured Directory</li> <li>• Acyclic-Graph Directory</li> <li>• General Graph Directory</li> </ul>	
91.	Device drivers		(i) Character devices such as printers, terminals (ii) Block devices (including all disk drives) and network interface devices.	
92.	Buffer cache		It is the kernel's main cache for block-oriented devices such as disk drives and is the main mechanism through which I/O to these devices is performed	
93.	C-SCAN Scheduling		C-SCAN means Circular SCAN algorithm. This Scheduling is a variant of SCAN designed to provide a more waiting time. This essentially treats the cylinder as a circular list that wraps around from the final cylinder to the first one.	
94.	SCAN Scheduling		<ul style="list-style-type: none"> <li>✓ In the SCAN algorithm, the disk arm starts at one end of the disk and moves toward the other end of the disk.</li> <li>✓ At the other end, the direction of head movement is reversed and servicing continues across the disk.</li> </ul>	

95.	FCFS Scheduling		It is Simplest form of Disk Scheduling. This algorithm serves the first come process always and is does not provide Fast service	
96.	SSTF Scheduling		SSTF Algorithm selects the request with the minimum seek time from the current head position. and SSTF chooses the pending request to the current head position.	
97.	types of Disk Scheduling		(i).SSTF Scheduling (ii).FCFS Scheduling (iii) SCAN Scheduling (iv).C-SCAN Scheduling (v).LOOK Scheduling.	
98.	characteristics of Disk Scheduling		1) Throughput 2) Mean Response Time 3) Variance of Response time	
99.	Why Disk Scheduling necessary		To avoid Disk arbitration which occurs when many processes try to read or write the records on disks at the same time, Disk Scheduling is necessary.	
100.	Disk Scheduling		Disk scheduling is a process of allocation of the disk to one process at a time. In multi-programmed system, many processes try to read or write the records on disks as the same time. To avoid disk arbitration, it is necessary.	

#### **Unit-V : Case Study – Linux System**

101.	Open Source Software		Open-source software is a type of computer software in which source code is released under a license .	
102.	Software		Software is a set of instructions or programs instructing a computer to do specific task.	
103.	Free Redistribution		License shall not restrict anybody from selling or giving away the software.	
104.	Shell		Shell is the utility Program that processes user requests.	
105.	Operating System		Operating system is a set of programs that act as a interface between the computer hardware and the user.	
106.	GNOME		GNU Network Object Model Environment, a GUI-based desktop environment used by Ubuntu	

			as well as several other distribution	
107.	GNU		GNU is an operating system and an extensive collection of computer software..	
108.	Terminal Emulator		A terminal emulator is a program that allows the use of the terminal in a graphical environment.	
109.	Console		Console is typically the primary interface for managing a computer.	
110.	BSD Unix		BSD is open source and free for all to use and share with practically without any restrictions.	
111.	Cron		Background service that schedules tasks to occur at certain times.	
112.	CUPS		Common Unix Printing System that work in the background to handle printing under OS Unix and Linux	
113.	Kernel		The kernel is the heart of the operating system.	
114.	FLOSS		Free, Libre, Open Source Software used within the community .	
115.	FOSS		Free or Open Source Software.	
116.	Grep		Global Regular Expression Print.	
117.	GRUB		Grand Unified Boot loader, boot manager program that offers a menu from which you can choose which operating system you wish to boot.	
118.	Red Hat		Well-known company that produces distributions of Linux	
119.	Ubuntu		It is Linux distribution with several unique characteristics.	
120.	XMMS		It is lightweight music player program.	
121.	Clone()		System call for creating a new process in Linux	
122.	SIGTERM()		Software termination signal.	
123.	Synaptic		Synaptic is the official package manager of mostly all Linux based OS such as Ubuntu, Linux Mint.	
124.	Personality()		System Call that executes Process Execution Environment.	
125.	GNU tools		<ul style="list-style-type: none"> <li>• Debugger</li> <li>• Gcc</li> </ul>	
<b>Placement Questions</b>				
126.	Belady's Anomaly		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.	
127.	binary semaphore		A binary semaphore is one, which takes only 0 and 1 as values. They are used to implement mutual exclusion and synchronize concurrent processes.	
128.	thrashing		It is a phenomenon in virtual memory schemes when the processor spends most of its time swapping pages, rather than executing instructions. This is due to an inordinate number of page faults.	
129.	Long term scheduler		Long term scheduler determines which programs are admitted to the system for processing. It controls the degree of multiprogramming. Once admitted, a job becomes a process.	
130.	Medium term scheduling		Medium term scheduling is part of the swapping function. This relates to processes that are in a blocked or suspended state. They are swapped out of real-memory until they are ready to execute. The swapping-in decision is based on memory-management criteria.	
131.	Short term scheduler		Short term scheduler, also know as a dispatcher executes most frequently, and makes the finest-grained decision of which process should execute next. This scheduler is invoked whenever an event occurs. It may lead to interruption of one process by preemption.	
132.	Turnaround time		Turnaround time is the interval between the submission of a job and its completion	
133.	Response time		Response time is the interval between submission of a request, and the first response to that request.	
134.	User data		Modifiable part of user space. May include program data, user stack area, and programs that may be modified.	
135.	System Stack		Each process has one or more LIFO stacks associated with it. Used to store parameters and calling addresses for procedure and system calls.	
136.	Process control Block	PCB	Info needed by the OS to control processes.	
137.	system in safe state		The set of dispatch able 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.	
138.	busy waiting		The repeated execution of a loop of code while waiting for an event to occur is called busy-waiting. The CPU is not engaged in any real productive activity during this period, and the process does not progress toward completion.	
139.	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.	
140.	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	
141.	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.	
142.	Dynamic scheduling		The number of thread in a program can be altered during the course of execution	
143.	rendezvous		In message passing, it is the condition in which, both, the sender and receiver are blocked until the message is delivered.	
144.	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.	
145.	page cannibalizing		Page swapping or page replacements are called page cannibalizing	

146.	process spawning		When the OS at the explicit request of another process creates a process, this action is called process spawning.	
147.	Process migration		It is the transfer of sufficient amount of the state of process from one machine to the target machine.	
148.	Mutant		In Windows NT a mutant provides kernel mode or user mode mutual exclusion with the notion of ownership	
149.	FtDisk		It is a fault tolerance disk driver for Windows NT.	
150.	Thread		The special thread a dispatcher will execute when no ready thread is found.	

**Faculty**

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