

Internal Assessment Test 1 – December 2023

Sub:	Operating Systems				Sub Code:	BCS303	Branch :	ISE		
Date:	19/12/2023	Duration:	90 min's	Max Marks:	50	Sem/Sec :	III A, B & C			OBE
<u>Answer any FIVE FULL Questions</u>							MARKS	CO	RB	T
1.a	Describe how Mac OS X is considered a hybrid system.					6	CO1	L1		
1.b	Explain direct and indirect communication with respect to message passing.					4	CO2	L2		
2.	Explain process states with state transition diagram. Also explain PCB with a neat diagram					10	CO2	L2		
3.a	Analyze modular kernel approach with layered approach with a neat sketch.					7	CO1	L2		
3.b	Why are clustered systems considered to provide high-availability service?					3	CO1	L1		
4.a	Differentiate between multiprogramming, multiprocessing and multitasking systems.					5	CO1	L2		
4.b	Explain why a modular kernel may be the best of the current operating system design techniques					5	CO1	L2		
5.a	Explain why an operating system can be viewed as a resource allocator					5	CO1	L2		
5.b	Explain about two operating systems currently dominate mobile computing?					5	CO1	L2		
6.a	Consider the set of given process with the Burst time .Calculate the Average Waiting Time and Turn Around Time for Shortest Job First (SJF) and First Come First Serve(FCFS).				Process	Burst Time	10	CO2	L3	
					P1	12				
					P2	11				
					P3	9				
					P4	9				

1. a. primarily because the kernel environment is a blend of the Mach microkernel and BSD UNIX (which is closer to a monolithic kernel.)

1. b. Direct Communication: In the Direct Communication, each process that wants to communicate must explicitly name the recipient or sender of the communication. In this scheme, the send and receive primitives are defined as follows:

Send (P, message) – Send a message to process P.

Receive (Q, message) – Receive a message from process Q.

Indirect Communication: With Indirect Communication, the messages are sent to and received from mailboxes. A mailbox can be viewed abstractly as, an object into which messages can be placed by processes and from which messages can be removed. The send and receive primitives are defined as follows:

Send (A, message) – Send a message to mailbox A.

Received (A, message) – Receive a message from mailbox A.

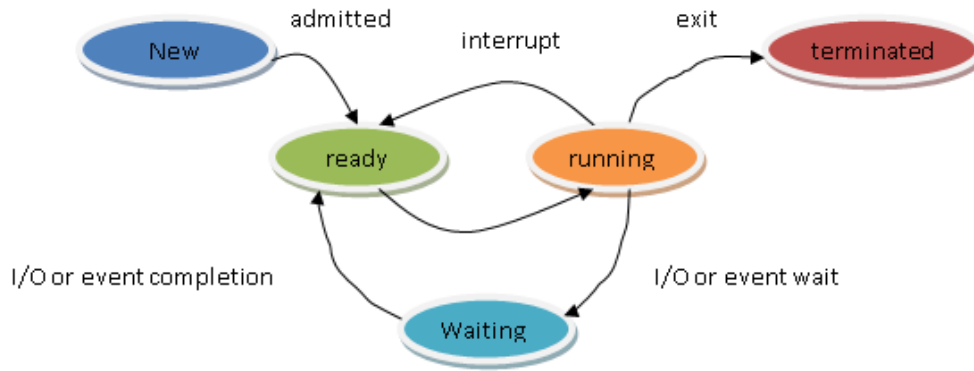
2. Process and Process State:

In this article, we are going to discuss about process, process state diagram and process control block (PCB). A process is a program which is currently in execution. A program by itself is not a process but it is a passive entity just like content of a file stored on disk, while a process is an active entity.

A process also includes the process stack, which contains temporary data (such as local variables, function parameters, return address), and a data section, which contains global variables and a heap-memory allocated to a process to run and process state that defines its current state.

A process changes its state during its execution. Each process may be in one of the following states:

1. New: when a new process is being created.
2. Running: A process is said to be in running state when instructions are being executed.
3. Waiting: The process is waiting for some event to occur (such as an I/O operation).
4. Ready: The process is waiting for processor.
5. Terminated: The process has finished execution.



Process State Diagram

Process Control Block (PCB):

Operating system maintains one special data structure called Process Control Block (PCB).

All the information about each process is stored in the process control block (PCB) which is maintained by operating system. It contains following information associated with a specific process.

- Process state: It represents current status of the process. It may be new, ready, running or waiting.
- Program counter: It indicates the address of the next instruction to be executed for this process.
- CPU Registers: They include index registers, stack pointer and general purpose registers. It is used to save process state when an interrupt occurs, so that it can resume from that state.
- CPU-scheduling information: it includes process priority, pointer to scheduling queue.
- Memory management information: value of the base and limit registers, page tables depending on the memory system.
- Accounting information: it contains an amount of CPU and real time used, time limits process number and so on.
- I/O status information: It includes a list of I/O devices allocated to the process, a list of open files and so on.
- Normally, operating system stores PCBs of processes into the ready queue for the process scheduling instead of the process itself.

3.b. Clustered systems are considered high-availability in that these types of systems have redundancies capable of taking over a specific process or task in the case of a failure. The redundancies are inherent due to the fact that clustered systems are composed of two or more individual systems coupled together.

4.a.

No	Characteristic	Multiprogramming	Multiprocessing	Multithreading
1	What it is:	The concurrent residency of more than	The availability of more than one processor per	A process is divided into

		one program in the main memory is called as multiprogramming.	system, which can execute several set of instructions in parallel is called as multiprocessing.	several different sub-processes called as threads, which has its own path of execution. This concept is called as multithreading.
2	Number of CPU:	One	More than one	Can be one or more than one
3	Job processing time:	More time is taken to process the jobs.	Less time is taken for job processing.	Moderate amount of time is taken for job processing.
4	Number of process being executed:	One process is executed at a time.	More than one process can be executed at a time	Various components of the same process are being executed at a time.
5	Economical:	It is economical.	Is less economical.	Is economical.
6	Number of users:	One at a time.	Can be one or more than one.	Usually one.
7	Throughput:	Throughput is less.	Throughput is maximum.	Moderate.
8	Efficiency:	Less	Maximum	Moderate
9	Categories:	No further divisions	Symmetric & Asymmetric.	No further divisions.

4. b. A modular kernel may be the best of the current operating system design techniques due to its flexibility, efficiency, and customizability.

A modular kernel is designed to have a small and basic kernel at its core, which can be expanded with modules to support specific functionalities or hardware. This approach allows for more efficient use of system resources, as only the necessary modules are loaded at boot time. Moreover, A modular kernel may be the best of the current operating system design techniques due to its flexibility, efficiency, and customizability. This means that the kernel can be adapted to a specific use case or environment, improving performance and reducing the risk of compatibility issues. Another advantage of modular kernels is their improved security. By having a small and basic kernel at its core, the attack surface is reduced, making it more difficult for attackers to find vulnerabilities. Additionally, the ability to add or remove modules allows for better control over the system's security features and protocols. Overall, a modular kernel is a more efficient, flexible, and secures approach to operating system design, making it a preferred option for modern computing environments. Its ability to be tailored to specific needs and requirements while minimizing resource usage and enhancing security is an advantage in today's rapidly changing technological landscape.

5. a. A computer system has many resources that may be required to solve a problem: CPU time, memory space, file-storage space, I/O devices, and so on. The operating system acts as the manager of these resources. Facing

numerous and possibly conflicting requests for resources, the operating system must decide how to allocate them to specific programs and users so that it can operate the computer system efficiently and fairly.

5. b. Android Operating System

Android is an open-source mobile OS developed by Google and launched in 2008. Android is a Linux-based OS that uses Linux 2.6 to provide core services such as security, memory management, process management, network stack, and a driver model. It offers a wide range of libraries that enable the app developers to build different applications. Android applications are usually written in Java programming language.

Apple iOS

Apple iOS is a closed-source code mobile phone OS developed by Apple in 2007; it is used by Apple-only products (iPhone, iPod, and iPad). The iOS architecture is based on three layers incorporated with each other. Cocoa touch is a layer that provides some basic infrastructure used by applications. The second layer is the media layer, which provides audio services, animation video, image formats, and documents in addition to providing two-dimensional (2D) and 3D drawings and audio and video support. The third layer is the core OS, which provides core services such as low-level data types, start-up services, network connection, and access

6.

Process	Burst Time
P1	12
P2	11
P3	9
P4	9

a.FCFs

P1	P2	P3	P4
0	12	23	32
			41

Average waiting time= $0+12+23+32/4=16.75$ units

Average Turn around Time = $12+23+32+41/4=27$ units

b.SJF

P3	P4	P2	P1
0	9	18	29
			41

Average waiting time= $29+18+0+9/4=14$ units

Average Turnaround Time = $41+29+9+18/4=24.25$ units