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Paper: Operating System (MID TERM)

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## **Q1. Explain the main purpose of an operating system?**

**Answer: An operating system has three main functions:**

(1) Manage the computer's resources, such as the central processing unit, memory, disk drives, and printers,

(2) Establish a user interface,

(3) Execute and provide services for applications software. Keep in mind, however, that much of the work of an operating system is hidden from the user; many necessary tasks are performed behind the scenes. In particular, the first listed function, managing the computer's resources, is taken care of without the user being aware of the details. Furthermore, all input and output operations, although invoked by an applications program, are actually carried out by the operating system. Although much of the operating system functions are hidden from view, you will know when you are using an applications software package, and this requires that you invoke-call into action-the operating system. Thus, you both establish a user interface and execute software

## **Q2. What are the advantages of a multiprocessor system?**

**Answer: Advantages of a Multiprocessor System:**

**Increased Throughput:** An increase in the number of processes completes the work in less time. It is important to note that doubling the number of processors does not halve the time to complete a job. It is due to the overhead in communication between processors and contention for shared resources etc.

### **More Economic Systems**

Multiprocessor systems are cheaper than single processor systems in the long run because they share the data storage, peripheral devices, power supplies etc. If there are multiple processes that share data, it is better to schedule them on multiprocessor systems with shared data than have different computer systems with multiple copies of the data.

**Increased Reliability** – In this system, as the workload is distributed among several processors which results in increased reliability. If one processor fails then its failure may slightly slow down the speed of the system but system will work smoothly.

**Cost Saving** – Parallel system shares the memory, buses, peripherals etc. Multiprocessor system thus saves money as compared to multiple single systems. Also, if a number of

programs are to operate on the same data, it is cheaper to store that data on one single disk and shared by all processors instead of using many copies of the same data.

**Less electricity usage:** In a single processor system, there is more load as many processes have to be executed at a time. But in multiprocessor system execution of multiple processes is done in a few times. That means multiprocessor CPUs consume low electricity than a single processor.

### **Q3. Describe the objective of multiprogramming.**

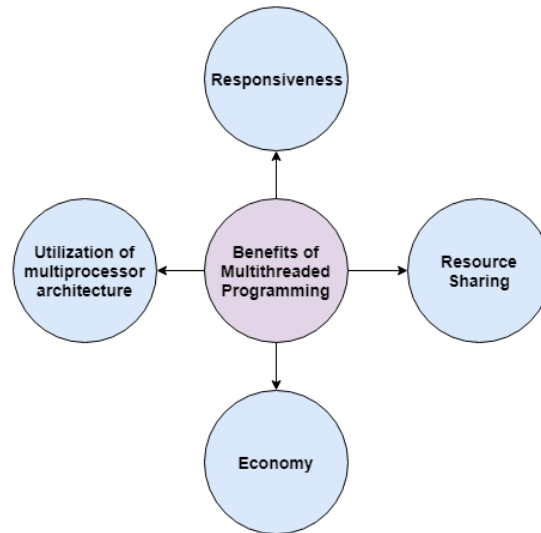
- **Answer:** The objective of multiprogramming is to have some process running at all times, to maximize CPU utilization. The objective of time sharing is to switch the CPU among processes so frequently that users can interact with each program while it is running. To meet these objectives, the process scheduler selects an available process (possibly from a set of several available processes) for program execution on the CPU. For a single-processor system, there will never be more than one running process. If there are more processes, the rest will have to wait until the CPU is free and can be rescheduled. In a computer system, there are multiple processes waiting to be executed, i.e. they are waiting when the CPU will be allocated to them and they begin their execution.
- These processes are initially kept in an area called job pool
- This job pool consists of all those processes awaiting allocation of main memory and CPU.
- The processor is shared amongst different processes.
- The main idea of multi programming is to maximize the CPU time.

### **Q4. Give some benefits of multithreaded programming.**

#### **Answer:**

Multithreading allows the execution of multiple parts of a program at the same time. These parts are known as threads and are lightweight processes available within the process. So multithreading leads to maximum utilization of the CPU by multitasking.

Some of the benefits of multithreaded programming are given as follows –



- **Resource Sharing**

All the threads of a process share its resources such as memory, data, files etc. A single application can have different threads within the same address space using resource sharing.

- **Responsiveness**

Program responsiveness allows a program to run even if part of it is blocked using multithreading. This can also be done if the process is performing a lengthy operation. For example - A web browser with multithreading can use one thread for user contact and another for image loading at the same time.

- **Utilization of Multiprocessor Architecture**

In a multiprocessor architecture, each thread can run on a different processor in parallel using multithreading. This increases concurrency of the system. This is in direct contrast to a single processor system, where only one process or thread can run on a processor at a time.

- **Economy**

It is more economical to use threads as they share the process resources. Comparatively, it is more expensive and time-consuming to create processes as they require more memory and resources. The overhead for process creation and management is much higher than thread creation and management.

## Q5. What is RR scheduling algorithm?

**Answer:** The name of this algorithm comes from the round-robin principle, where each person gets an equal share of something in turns. It is the oldest, simplest scheduling algorithm, which is mostly used for multitasking.

In Round-robin scheduling, each ready task runs turn by turn only in a cyclic queue for a limited time slice. This algorithm also offers starvation free execution of processes.

### ***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

## **Characteristics of Round-Robin Scheduling**

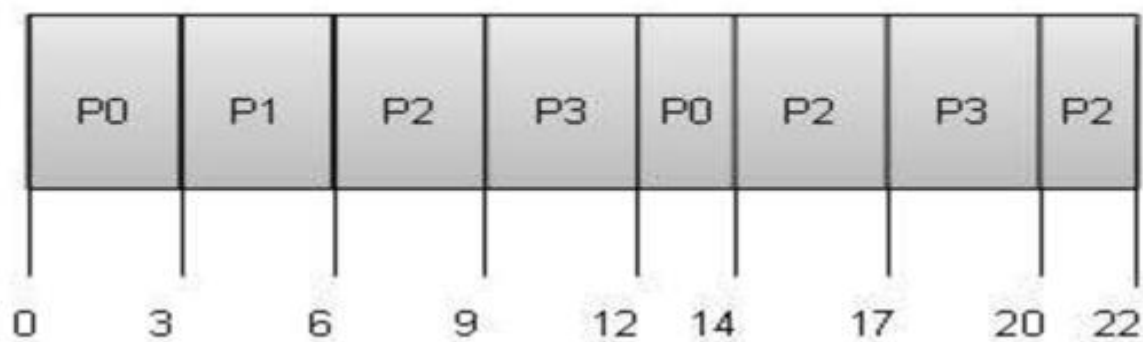
Here are the important characteristics of Round-Robin Scheduling:

- Round robin is a pre-emptive algorithm
- The CPU is shifted to the next process after fixed interval time, which is called time quantum/time slice.
- The process that is preempted is added to the end of the queue.
- Round robin is a hybrid model which is clock-driven
- Time slice should be minimum, which is assigned for a specific task that needs to be processed. However, it may differ OS to OS.
- It is a real time algorithm which responds to the event within a specific time limit.
- Round robin is one of the oldest, fairest, and easiest algorithms.
- Widely used scheduling method in traditional OS.

## **Example of Round-robin Scheduling:**

Process	Arrival Time	Execute Time
P0	0	5
P1	1	3
P2	2	8
P3	3	6

Quantum = 3



- **Wait time** of each process is as follows

Process	Wait Time : Service Time - Arrival Time
P0	$(0 - 0) + (12 - 3) = 9$
P1	$(3 - 1) = 2$
P2	$(6 - 2) + (14 - 9) + (20 - 17) = 12$
P3	$(9 - 3) + (17 - 12) = 11$

- Average Wait Time:  $(9+2+12+11) / 4 = 8.5$

## **Q6: What are the primary differences between Network Operating System and Distributed Operating System?**

**Answer:** Network and Distributed Operating systems have a common hardware base, but the difference lies in software.

### **1. Network Operating System:**

- A network operating system is made up of software and associated protocols that allow a set of computer network to be used together.
- Environment users are aware of multiplicity of machines.
- Control over file placement is done manually by the user.
- Performance is badly affected if certain part of the hardware starts malfunctioning
- Remote resources are accessed by either logging into the desired remote machine or transferring data from the remote machine to user's own machines.

### **2. Distributed Operating System:**

- A distributed operating system is an ordinary centralized operating system but runs on multiple independent CPUs.
- Environment users are not aware of multiplicity of machines.
- It can be done automatically by the system itself.
- It is more reliable or fault tolerant i.e. distributed operating system performs even if certain part of the hardware starts malfunctioning.
- Users access remote resources in the same manner as they access local resources.

**Q7: What inconveniences that a user can face while interacting with a computer system, which is without an operating system.**

**Answer:** Operating system is a required component of the computer system.

Without an operating system computer hardware is only an inactive electronic machine, which is inconvenient to user for execution of programs.

As the computer hardware or machine understands only the machine language. It is difficult to develop each and every program in machine language in order to execute it.

Thus without operating system execution of user program or to solve user problems is extremely difficult.

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