

Programme Name: \_\_\_\_\_\_\_\_\_\_\_\_\_BCS\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Course Code: \_\_\_CSC 1016\_\_\_\_\_\_\_

Course Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Operating System\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Internal exam

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1. What is Operating System? Describe the different scheduling criteria.

Answer:

An Operating System (OS) is an interface between a computer user and computer hardware. An operating system is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers. Some popular Operating Systems include Linux Operating System, Windows Operating System, VMS, OS/400, AIX, z/OS, etc.

The different Scheduling Criteria are given below:

**CPU Utilization**

To make out the best use of CPU and not to waste any CPU cycle, CPU would be working most of the time (Ideally 100% of the time). Considering a real system, CPU usage should range from 40% (lightly loaded) to 90% (heavily loaded.)

**Throughput**

It is the total number of processes completed per unit time or rather say total amount of work done in a unit of time. This may range from 10/second to 1/hour depending on the specific processes.

**Turnaround Time**

It is the amount of time taken to execute a particular process, i.e. The interval from time of submission of the process to the time of completion of the process (Wall clock time).

**Waiting Time**

The sum of the periods spent waiting in the ready queue amount of time a process has been waiting in the ready queue to acquire get control on the CPU.

**Load Average**

It is the average number of processes residing in the ready queue waiting for their turn to get into the CPU.

**Response Time**

Amount of time it takes from when a request was submitted until the first response is produced. Remember, it is the time till the first response and not the completion of process execution (final response).

2. Define the following terms:

a. Virtual Machine

A virtual machine (VM) is an operating system (OS) or application environment that is installed on software, which imitates dedicated hardware. The end user has the same experience on a virtual machine as they would have on dedicated hardware. A virtual machine is a program that acts as a virtual computer. It runs on your current operating system (the host operating system) and provides virtual hardware to guest operating systems. The guest OS runs in a window on your host OS, just like any other program on your computer.

b. Kernel

A kernel is the core component of an operating system. It is also a system program. It is the part of Operating System which coverts user command into machine language. t can be thought of as the program which controls all other programs on the computer. When the computer starts, it goes through some initialization (booting) functions, such as checking memory. It is responsible for assigning and unassigning memory space which allows software to run.

3. Differentiate between:

a. Preemptive and Non-preemptive

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| --- | --- |
| Preemptive Scheduling | Non-preemptive Scheduling |
| A processor can be preempted to execute the different processes in the middle of any current process execution. | Once the processor starts its execution, it must finish it before executing the other. It can't be paused in the middle. |
| CPU utilization is more efficient compared to Non-Preemptive Scheduling. | CPU utilization is less efficient compared to preemptive Scheduling. |
| Waiting and response time of preemptive Scheduling is less. | Waiting and response time of the non-preemptive Scheduling method is higher. |
| Examples: - Shortest Remaining Time First, Round Robin, etc. | Examples: First Come First Serve, Shortest Job First, Priority Scheduling, etc. |

b. CPU & I/O Bound

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| CPU Bound | I/O Bound |
| CPU bound means the program is bottlenecked by the CPU, or central processing unit | I/O bound means the program is bottlenecked by I/O, or input/output, such as reading or writing to disk, network, etc. |
| A task that performs calculations on a small set of numbers, for example multiplying small matrices, is likely to be CPU Bound. | A task that processes data form disk, for example, counting the number of lines in a file is likely to be I/O Bound |
| A program is CPU bound if it would go faster if the CPU were faster | A program is I/O bound if it would go fsater if the I/O subsystem was faster. |

4. Memory Management is the process of controlling and coordinating computer memory and assigning portions. Here is given five memory partitions of 100K, 500K, 200K, 300K (in order).

a. How would the first-fit, best-fit, and worst-fit algorithms place processes of 190 K, 288 K, 112 K, and 250 K (in order)?

* First-fit :  
      190K process in the memory partition of 200K (10K left)  
      288K process in the memory partition 300K (12K left)  
      112K process in the memory partition 100K (leftover of the first process 300K ? 288K fit.)  
      500K process cannot be allocated in the memory because of external fragmentation.
* Best-fit:  
      190K process in the memory partition of 200K.  
      288K process in the memory partition of 300K.  
      112K process in the memory partition of 100K.  
      250K process in the memory partition of 500K.
* Worst-fit:  
      190K process in the memory partition of 500K. (310K left)  
      288K process in the memory partition of 300K.  (12K left)  
      112K process in the memory partition of 200K.  (Leftover of the first process 500K ? 190K fit)  
      250K process cannot be allocated in the memory because of external fragmentation.
* Since Best fit can allocate all processes in the memory, it is the best algorithm to make the most efficient use of memory.

