**Q. What are the three main purposes of an operating system?**

* **Resource Management** – managing the CPU, I/O devices and peripherals connected to the system.
* **Time Management** – make sure each program/process gets fair amount of time with the CPU and the system doesn’t face any performance degradation
* **Memory Management** – allocating memory to programs when needed and de-allocating it after the program has finished execution.

**Q.** **When is it appropriate for the operating system to “waste” resources? Why is such a system not really wasteful?**

* Give smooth user experience by allocating extra resources like memory or CPU cycles for loading GUI and handle sudden requests of the user.
* Better stability can be provided by allocating extra memory for efficient error handling.
* Performance optimization could be achieved by pre-allocating memory for frequently used programs/data/processes.

Such system is not wasteful. In the end this wastage results in better system performance so in truth the resources are contributing rather than being wasted.

**Q. What is the main difficulty that a programmer must overcome in writing an operating system for a real-time environment?**

ANS: Optimization of the system. This includes desirable response time to user’s request and proper scheduling of tasks and management of resources.

**Q. Keeping in mind the various definitions of operating system, consider whether the operating system should include applications such as web browsers and mail programs. Argue both that it should and that it should not, and support your answers.**

|  |  |
| --- | --- |
| **Should** | **Shouldn’t** |
| OS is a control program. By going with this definition if the applications mentioned are to be included in the OS it could prevent errors and improper use of these application improving their security and performance. | OS already sustains a lot of workload. Adding this will result in unusual performance as these programs needs additional resources hence degrading the performance. Plus the boot time could increase exponentially. |

**Q. Timers could be used to compute the current time. Provide a short description of how this could be accomplished.**

ANS: It can be achieved by a fixed rate clock and a counter. The fixed rate clock can be tracked from a specific point using a system call called *stamp*. The counter can be incremented with respect to the elapsed time. The final value is obtained by adding the counter’s value with the stamp.

**Q. Give two reasons why caches are useful. What problems do they solve? What problems do they cause? If a cache can be made as large as the device for which it is caching (for instance, a cache as large as a disk), why not make it that large and eliminate the device?**

ANS: *Reasons why they are useful*:

1. Performance of the system is improved as caches store frequently accessed data/programs. Retrieval of data is much quicker as they are inside the processor.
2. System efficiency is improved as memory traffic is reduced due to them being inside the processor hence the need to access the slower main memory is reduced.

Caches solve the problem of significant speed gaps between two components through saving copies of frequently accessed data.

Caches are usually not as large as the device to which they are catering. To design a cache which will replace the device would be costly as the scope of cache is being enlarged to fulfill the device function too. Plus the performance will not increase as due to size increase the lookup time will increase hence defeating the main purpose of a cache.