**TUGAS MATKUL PRAKTEK ALGORITMA**

**DAN STRUKTUR DATA**

**(PERTEMUAN 2)**



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**1.1**

The main components of an operating system include the kernel, file system, memory manager, process scheduler, device drivers, and user interface. These components work together to manage hardware resources and provide services to user applications.

**1.2**

An operating system acts as an intermediary between users and computer hardware. It provides an environment for application execution, manages hardware resources, enables user interface, ensures system security, and provides file management services.

**1.3**

The key differences between batch processing, time-sharing, and real-time operating systems are:

- Batch processing: Executes jobs without user interaction, optimizes throughput

- Time-sharing: Allows multiple users to interact with the system simultaneously, optimizes response time

- Real-time: Guarantees a response within specific time constraints, optimizes predictability

**1.4**

The major functions of an operating system's kernel include process management, memory management, I/O management, interrupt handling, and providing system calls for applications to access hardware resources safely.

**1.5**

In a multiprogramming environment, multiple programs reside in memory simultaneously. When one process is waiting for I/O, the CPU can switch to another process, thereby increasing CPU utilization and system throughput.

**1.6**

The main difference between a monolithic kernel and a microkernel is their structure:

- Monolithic kernel: All OS services run in kernel space, offering better performance but less modularity

- Microkernel: Only essential services run in kernel space while others run in user space, offering better stability and modularity but potentially lower performance

**1.7**

The primary advantages of a distributed operating system include resource sharing, reliability through redundancy, scalability, and the ability to balance computational load across multiple systems.

**1.8**

Virtualization in operating systems refers to creating virtual versions of hardware platforms, storage devices, or network resources. Its benefits include server consolidation, improved resource utilization, isolation between applications, and simplified system administration.

**1.9**

System calls provide a programming interface between applications and the operating system kernel. They allow applications to request services from the operating system, such as file operations, process creation, and memory allocation.

**1.10**

The process state transition diagram typically includes states such as:

- New: Process is being created

- Ready: Process is waiting to be assigned to the CPU

- Running: Process is executing on the CPU

- Waiting/Blocked: Process is waiting for an event (I/O completion)

- Terminated: Process has finished execution

**1.11**

Process control blocks (PCBs) contain information about processes including process ID, process state, program counter, CPU registers, CPU scheduling information, memory management information, accounting information, and I/O status information.

**1.12**

Context switching refers to saving the state of a currently executing process and loading the saved state of another process so that execution can be resumed from where it was interrupted. This enables multitasking but introduces overhead.

**1.13**

The main scheduling algorithms include:

- First-Come, First-Served (FCFS): Processes are executed in arrival order

- Shortest Job First (SJF): Process with shortest execution time runs first

- Priority Scheduling: Process with highest priority runs first

- Round Robin (RR): Each process gets a small unit of CPU time in a circular fashion

- Multilevel Queue: Processes are permanently assigned to a queue, with each queue having its own scheduling algorithm

**1.14**

The criteria used to evaluate CPU scheduling algorithms include CPU utilization, throughput, turnaround time, waiting time, response time, and fairness.

**1.15**

Deadlock occurs when two or more processes are waiting indefinitely for resources held by each other. The four necessary conditions for deadlock are mutual exclusion, hold and wait, no preemption, and circular wait.

**1.16**

Deadlock prevention strategies include:

- Eliminating mutual exclusion where possible

- Requiring processes to request all resources at once (eliminating hold and wait)

- Allowing resource preemption

- Imposing a total ordering on resource types to prevent circular wait

**1.17**

Memory management in operating systems involves keeping track of which parts of memory are in use, allocating memory to processes when needed, and deallocating it when no longer required. It also includes address translation from logical to physical addresses.

**1.18**

Virtual memory allows a computer to use disk space as an extension of RAM, enabling programs to use more memory than physically available. It works by transferring data between RAM and disk storage as needed, using techniques like paging or segmentation.

**1.19**

Page replacement algorithms decide which memory pages to swap out when a new page needs to be brought in. Common algorithms include:

- First-In, First-Out (FIFO): Replaces the oldest page

- Optimal: Replaces the page that won't be used for the longest time

- Least Recently Used (LRU): Replaces the page that hasn't been used for the longest time

- Clock (Second Chance): Modified FIFO that gives pages a second chance

**1.20**

Thrashing occurs when a computer's virtual memory resources are overused, leading to a constant state of paging where the system spends more time swapping pages than executing applications. This drastically reduces system performance.

**1.21**

File systems provide mechanisms for storing and organizing data on storage devices. Their main components include directory structure, file allocation tables, free space management, and file control blocks.

**1.22**

Common file allocation methods include:

- Contiguous allocation: Files occupy consecutive blocks

- Linked allocation: Each block points to the next block

- Indexed allocation: Special index blocks contain pointers to all blocks of a file

**1.23**

The advantages of using a journaling file system include:

- Faster recovery after system crashes

- Reduced risk of data corruption

- Prevention of file system inconsistency

- Ability to roll back incomplete operations

**1.24**

I/O management involves coordinating all input and output operations in a computer system. The OS provides device drivers, buffering mechanisms, caching, spooling, and device-independent interfaces to manage I/O efficiently.

**1.25**

Security in operating systems is implemented through:

- Authentication: Verifying user identity

- Authorization: Determining access rights

- Access control: Enforcing permissions

- Encryption: Protecting sensitive data

- Auditing: Tracking system activities

- Process isolation: Preventing interference between processes

**1.26**

UNIX/Linux and Windows differ in:

- Architecture: UNIX has a monolithic kernel; Windows has a hybrid kernel

- User interface: UNIX traditionally command-line; Windows primarily GUI

- File system: UNIX uses hierarchical directories with extensions optional; Windows uses drive letters with enforced extensions

- Security model: UNIX uses user/group/other permissions; Windows uses Access Control Lists

- Target market: UNIX for servers and technical users; Windows for general consumers and enterprise

**1.27**

Cloud operating systems are designed to manage cloud computing environments. They differ from traditional operating systems in their focus on distributed resources, elasticity, multi-tenancy support, service-oriented architecture, and advanced virtualization capabilities.

Please let me know if you need more specific answers or if you'd like to share the actual questions from your textbook.