Lecture 1: Operating System Structures

1. What is an Operating System (OS)?

- Definition: An OS is software that manages hardware resources and provides services for application programs. It acts as an intermediary between users and the computer hardware.
- Functions:
    - Allocates resources (CPU, memory, storage).
    - Manages execution of processes.
    - Provides interfaces (e.g., graphical or command-line).

Examples:

- Windows facilitates user interaction with a graphical interface.
- Linux is widely used for servers due to its efficiency.

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2. Objectives of an Operating System

- Convenience: Makes computing easier with interfaces (e.g., Windows' Start menu).
- Efficiency: Ensures optimal resource utilization.
    - Example: Multitasking in Linux uses CPU cycles efficiently.
- Security: Protects user data and prevents unauthorized access.
    - Example: Android restricts app permissions to protect user privacy.
- Flexibility: Allows system updates and adaptations without major disruptions.
    - Example: macOS regularly adds new features while maintaining stability.

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3. Services Provided by an OS

- Program Development: Includes tools like editors and compilers.
    - Example: Windows provides Notepad and Visual Studio for programming.
- Program Execution: Loads programs, initializes the environment, and schedules execution.
    - Example: The Task Manager in Windows allows users to view and manage running processes.
- Error Handling: Detects and manages software and hardware errors.
    - Example: A "blue screen" in Windows alerts users of critical failures.

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4. Types of Computer Systems Managed by OS

1. Batch Systems: Process jobs sequentially in batches without user interaction, maximizing resource utilization (e.g., early payroll systems).
2. Multi-Programmed Batch Systems: Handle multiple programs in memory, using job scheduling to optimize CPU and I/O usage (e.g., one program processes while another waits for I/O).
3. Time-Sharing Systems: Enable multiple users to interact simultaneously with rapid switching between jobs for low response times (e.g., Unix systems).
4. Personal Computer Systems: Designed for single users with dedicated hardware; data sharing possible via networking (e.g., Windows and macOS desktops).
5. Distributed Systems: Networked computers operate as a cohesive system; examples include cloud computing with client-server or peer-to-peer setups.
6. Parallel Systems: Utilize multiple CPUs to process independent tasks concurrently, ideal for high-performance applications like scientific simulations (e.g., supercomputers).
7. Clustered Systems: Multiple systems work together, sharing resources to enhance reliability; can be asymmetric (standby systems) or symmetric (all active) (e.g., high-availability server clusters).
8. Real-Time Systems: Operate under strict timing constraints for critical applications:
    - Hard Real-Time: Guarantees timely task completion (e.g., industrial robots).
    - Soft Real-Time: Prioritizes tasks without strict timing guarantees (e.g., multimedia systems).
9. Handheld Systems: Feature limited resources and compact designs for mobile use (e.g., smartphones and tablets).
10. Hybrid Systems: Combine features from various system types for versatility, such as batch processing with time-sharing (e.g., Linux).

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5. Categories of Computers

- Mobile Devices:
    - Small, portable devices with limited processing power.
    - Example: Smartphones and tablets.
- Microcomputers (PCs):
    - Individual use for business or personal tasks.

    - Example: Laptops running Windows or macOS.
- Midrange Computers:
    - Larger capacity than PCs, used in small-to-medium organizations.
    - Example: Minicomputers for departmental data management.
- Mainframes:
    - High-volume transaction processing.
    - Example: IBM Z-series for banking operations.
- Supercomputers:
    - Handle massive calculations with immense speed.
    - Example: NASA's systems for space simulations.

Lecture 2: Operating System Structures

1. System Components

- CPU: Central Processing Unit responsible for executing instructions.
- Storage-Device Hierarchy: Organized by speed, cost, and volatility.
- Random Access Memory (RAM): Volatile memory with individual addresses for each byte.

2. CPU and Machine Cycle

- Machine Cycle:
    - Fetch: Instruction is fetched.
    - Decode: Instruction is decoded for execution.
    - Execute: Instructions are carried out.
    - Store: Results are stored in CPU registers.

3. Storage Devices

- Magnetic Hard Drives: Organized into tracks, sectors, clusters, and cylinders.
- Reading/Writing Data: Can be impeded by obstacles damaging the disk surface.

4. Common System Components

- Process Management: Manages processes, their creation, deletion, and synchronization.
- Main Memory Management: Tracks memory usage and allocates/deallocates memory.
- Secondary-Storage Management: Manages disk space and storage allocation.
- I/O System Management: Manages input/output operations.
- File Management: Handles file creation, deletion, and access.

- Protection System: Controls access to resources.
- Networking: Manages network connections.
- Command-Interpreter System: Interprets commands given to the OS.

5. Process Management

- A process is a program in execution, requiring resources like CPU time and memory.
- Responsibilities:
  - Process creation and deletion.
  - Synchronization and communication.

6. Main-Memory Management

- Volatile Storage: Loses data on failure.
- OS Responsibilities:
  - Track memory usage.
  - Allocate and deallocate memory.

7. Secondary-Storage Management

- Provides non-volatile storage for data and programs.
- OS Responsibilities:
  - Free space management.
  - Storage allocation and disk scheduling.

8. I/O System Management

- Comprises:
  - Buffer-caching system.
  - Device-driver interface.
- I/O Operations:
  - Devices execute concurrently with the CPU.
  - Device controllers manage specific devices.

9. Interrupts

- Common Functions:
  - Transfers control to the interrupt service routine (ISR).
  - Saves the state of the CPU.
  - Disables incoming interrupts during processing.
- Classes of Interrupts:

- Program (e.g., arithmetic overflow).
- Timer.
- I/O.
- Hardware failure.

10. I/O Methods

- Synchronous I/O: Process waits for I/O completion.
- Asynchronous I/O: Control returns immediately; I/O continues in the background.

11. Direct Memory Access (DMA)

- High-speed I/O devices transfer data directly to main memory without CPU intervention.

12. File Management

- Manages files and directories.
- OS Responsibilities:
  - File creation, deletion, and manipulation.

13. Protection System

- Controls access to resources, distinguishing authorized from unauthorized usage.

14. Command-Interpreter System

- Interprets control statements for process and I/O management.

15. System Calls

- Interface between running programs and the OS.
- Parameter Passing Methods:
  - Registers.
  - Memory tables.
  - Stack operations.

16. System Programs

- Provide a development environment, including file manipulation and programming language support.

17. System Structure

- Simple Approach: MS-DOS and UNIX have limited structuring.
- Layered Approach: The OS is divided into layers, with each layer built on the functions of lower layers.

18. System Design Goals

- User Goals: Convenience, reliability, and performance.
- System Goals: Flexibility, maintainability, and efficiency.

19. System Implementation

- Modern OS can be written in high-level languages for easier development and portability.

Examples

- Process Management: Creating a new process when a user opens an application.
- Memory Management: Allocating memory for a new program while ensuring existing programs remain unaffected.
- File Management: Creating a new file and managing its access permissions.
- I/O Management: Using DMA for fast data transfer when reading from a hard disk.

Lecture 3 & 4: Process Management

I. Processes

Process Concept

- A Process is a program in execution, which is the entity assigned to processors.
- Terms "job" and "process" are often used interchangeably.

Process States

- New: Process is being created.
- Running: Instructions are being executed (has the CPU).
- Waiting (Blocked): Process is waiting for an event (e.g., I/O completion).
- Ready: Process is ready to use the CPU.
- Terminated: Process has finished execution.

Process Control Block (PCB)

- Also known as "process descriptor."
- Contains:
    - Current state
    - Unique identification
    - Pointers to parent and child processes
    - Pointers to allocated resources (e.g., memory range)
    - CPU scheduling information

Process Scheduling Queues

- Job Queue: All processes in the system.
- Ready Queue: Processes ready to execute.
- Device Queues: Processes waiting for I/O devices.
- Processes migrate between these queues.

Schedulers

- Long-term Scheduler (Job Scheduler): Decides which processes to bring into the ready queue.
- Short-term Scheduler (CPU Scheduler): Decides which process to execute next.
- Medium-term Scheduler: Handles processes that need to be swapped out.

Operations on Processes

- Create, destroy, suspend, resume, change priority, block, wake up, dispatch, and enable interprocess communication.

Process Creation

- Steps:
    - Define the process name.
    - Insert it into the process table.
    - Set initial priority and create the PCB.
    - Allocate initial resources.
- Parent Process: Creates a child process.
- Resource Sharing:
    - Parent and child can share all resources, some, or none.
    - Parent and children execute concurrently.

Process Termination

- Involves removing the process from the system, returning resources, and erasing the PCB.

Threads

- A Thread (lightweight process) is a basic unit of CPU utilization, sharing code, data, and OS resources.
- Multiple threads can run concurrently, improving performance (e.g., Producer-Consumer Problem).
- Types:
  - Kernel-level threads: Managed by the OS.
  - User-level threads: Managed by user-level libraries.
  - Hybrid: Combines both.

Interprocess Communication (IPC)

- Mechanism for processes to communicate and synchronize.
- Message System: Processes communicate without shared variables.
- Operations:
  - send(message)
  - receive(message)

Logical IPC

- Communication can be direct or indirect.
- Can be symmetric or asymmetric, with various buffering strategies.

Direct Communication

- Processes must name each other explicitly:
  - send(P, message) to send to process P.
  - receive(Q, message) to receive from Q.

Indirect Communication

- Messages are sent and received from mailboxes (ports).
- Operations include creating, sending, receiving, and destroying mailboxes.

Buffering Strategies

1. Zero Capacity: Sender waits for receiver.
2. Bounded Capacity: Finite length; sender waits if full.

3. Unbounded Capacity: Infinite; sender never waits.

II. CPU Scheduling

Basic Concepts

- CPU Scheduling maximizes CPU utilization.
- Processes cycle through CPU usage and I/O usage.

CPU Burst Times

- Described as:
  - I/O-bound processes: Short CPU bursts.
  - CPU-bound processes: Long CPU bursts.

Preemptive vs. Nonpreemptive Scheduling

- Nonpreemptive: Once a process has the CPU, it cannot be taken away.
- Preemptive: The CPU can be taken away, useful for high-priority processes.

Scheduling Criteria

- CPU Utilization: Keep CPU busy.
- Throughput: Number of processes completed per time unit.
- Turnaround Time: Total time to execute a process.
- Waiting Time: Time a process waits in the ready queue.
- Response Time: Time from request submission to first response.

Optimization Criteria

- Maximize CPU utilization and throughput.
- Minimize turnaround, waiting, and response times.

Priorities

- Assigned automatically or externally; can be static (unchanging) or dynamic (changeable).

Scheduling Algorithms

1. First-Come, First-Served (FCFS) Scheduling

Description: Processes are dispatched in the order they arrive. It is a non-preemptive scheduling method.

Example:

- Processes:
  - P1: 24 ms
  - P2: 3 ms
  - P3: 3 ms

| P1 | P2 | P3 |

0 24 27 30

Waiting Times:

- P1: 0 ms
- P2: 24 ms
- P3: 27 ms
- Average Waiting Time: (0 + 24 + 27) / 3 = 17 ms

2. Round Robin (RR) Scheduling

Description: Each process gets a fixed time slice (quantum). If the process does not finish in its time slice, it is placed at the end of the queue.

Example:

- Processes:
  - P1: 53 ms
  - P2: 17 ms
  - P3: 68 ms
  - P4: 24 ms
- Time Quantum: 20 ms

| P1 | P2 | P3 | P4 | P1 | P3 |

0 20 37 57 77 93 111

Performance:

- Guarantees reasonable response time.
- The overhead should be minimized.

3. Shortest Job First (SJF) Scheduling

Description: The process with the smallest estimated run time is executed next. Can be preemptive or non-preemptive.

Example:

- Processes:
  - P1: 8 ms
  - P2: 4 ms
  - P3: 9 ms
  - P4: 5 ms

Non-Preemptive

| P2 | P4 | P1 | P3 |

0 4 9 17 26

Waiting Times:

- P1: 9 ms
- P2: 0 ms
- P3: 17 ms
- P4: 4 ms
- Average Waiting Time: (9 + 0 + 17 + 4) / 4 = 7.5 ms

4. Priority Scheduling

Description: Each process is assigned a priority. The CPU is allocated to the process with the highest priority (smallest integer).

Example:

- Processes:
  - P1: 10 ms (Priority 2)
  - P2: 1 ms (Priority 1)
  - P3: 2 ms (Priority 3)

| P2 | P3 | P1 |

0 1 3 13

Waiting Times:

- P1: 3 ms
- P2: 0 ms
- P3: 1 ms
- Average Waiting Time: (3 + 0 + 1) / 3 = 1.33 ms

Summary of Key Points

- FCFS: Simple but can lead to long waiting times for short processes.
- RR: Fair sharing of CPU time, good for time-sharing systems.
- SJF: Optimal for minimizing average waiting time but can cause starvation.
- Priority Scheduling: Can solve starvation with aging techniques.

Lecture 5:Deadlocks

1. Deadlock Problem

Example Scenario

- System: Two tape drives.
- Processes:
  - P1 holds Tape Drive 1 and waits for Tape Drive 2.
  - P2 holds Tape Drive 2 and waits for Tape Drive 1.

P1: Holds Tape Drive 1 -------> Waits for Tape Drive 2

P2: Holds Tape Drive 2 -------> Waits for Tape Drive 1

2. Bridge Crossing Example

Example Scenario

- Traffic: Only flows in one direction on a bridge.
- Resource: Each section of the bridge acts as a resource.

- Deadlock: If multiple cars reach the bridge and block each other, they must back up to free the bridge.

Cars (C1, C2, C3) reach the bridge:

C1 <------ C2 <------ C3

If C2 wants to go forward but is blocked by C1, a deadlock occurs.

3. Resource Allocation Graph (RAG)

Example Scenario

- Processes: P1 and P2.
- Resources: R1 and R2.

Graph:

- P1 requests R1, and R2 is held by P2.
- P2 requests R2, and R1 is held by P1.

P1 ---> R1 (holds)

P2 ---> R2 (holds)

- Circular Wait: P1 waits for R2, and P2 waits for R1.

4. Deadlock Prevention Example

Scenario

- Hold and Wait Prevention: Require processes to request all resources before execution.

Example:

- Process P1 must request both Tape Drive 1 and Tape Drive 2 before it starts executing.

5. Deadlock Avoidance Example

Banker's Algorithm Scenario

- Processes: P1 and P2.
- Resource Requirements:
  - P1: Maximum 3 units of resource A.

  - P2: Maximum 2 units of resource A.
- Available Resources: 2 units of A.

Safe State Example:

- If P1 requests 2 units and gets them, it can finish and release resources, allowing P2 to then finish.

Available: 2 units

P1: Needs 1 more to finish

P2: Can be satisfied after P1 finishes

6. Deadlock Detection Example

Scenario

- Wait-For Graph:
  - P1 waits for P2.
  - P2 waits for P1.

P1 ---> P2

P2 ---> P1

- This cycle indicates a deadlock.

7. Recovery from Deadlock Example

Process Termination

- Scenario: Abort one process at a time until the deadlock is resolved.

Example:

- If P1 and P2 are deadlocked, abort P1 first, check if the deadlock is resolved.

8. Resource Preemption Example

Scenario

- Victim Selection: Choose a process to preempt based on resource usage and priority.

Lecture 7 & 8: Memory Management and Virtual Memory

1. Background

- Programs need to be brought into memory for execution.
- Input Queue: A collection of processes waiting on disk to be loaded into memory.
- Motivation: Multiple processes in memory improve system performance.
- Memory is a large array of words/bytes, each with a unique address.
- Memory management methods are dependent on both application and hardware.
- Challenge: Memory is often insufficient to meet demands, necessitating advanced management techniques.

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2. Binding of Instructions and Data to Memory

- Compile Time:
  - Memory location is predetermined.
  - Changes require recompilation.
  - Example: MSDOS system files.
- Load Time:
  - Addresses determined during loading.
  - Relocation addresses are fixed for runtime.
  - Example: MSDOS applications (historically).
- Execution Time:
  - Binding is delayed until runtime.
  - Allows processes to move during execution.
  - Common in modern multitasking systems like UNIX and Windows.

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3. Logical vs. Physical Address Space

- Logical Address: Generated by the CPU.
- Physical Address: Corresponds to an actual memory location.
- Logical and physical addresses:
    - Are identical in compile-time binding.
    - Differ in load-time and execution-time binding.

Memory Management Unit (MMU):

- A hardware device that maps logical to physical addresses.
- Relocation Register:
    - Value added to logical addresses to produce physical addresses.
    - User programs deal only with logical addresses.

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4. Techniques in Memory Management

- Dynamic Loading:
    - Routines are loaded only when called.
    - Improves memory utilization.
    - Ideal for large programs handling infrequent cases.
- Dynamic Linking:
    - Frequently used routines are not linked into the program but accessed via a stub.
    - Advantages:
        - Saves memory space.
        - Updates to shared libraries benefit all applications.
    - Disadvantages:
        - New library bugs affect all dependent applications.
- Overlays:
    - Only required instructions and data are loaded into memory.
    - Useful when process size exceeds available memory.
    - Complex to implement without OS support.

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5. Contiguous Allocation

- Single Partition:
  - OS resides in low memory; user processes in high memory.
  - Protects user processes from each other.
- Multiple Partition:
  - Memory divided into variable-sized holes.
  - Allocation Strategies:
    1. First-Fit: Allocates the first available hole.
    2. Best-Fit: Allocates the smallest hole sufficient for the request.
    3. Worst-Fit: Allocates the largest available hole.
- Fragmentation:
  - External: Non-contiguous free memory blocks.
  - Internal: Allocated memory exceeds process requirements.
  - Compaction:
    1. Rearranges memory to consolidate free space.
    2. Requires dynamic relocation.

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6. Swapping

- Temporarily moves processes from memory to backing store and back.
- Backing Store:
  - High-speed disk to store memory images.
- Roll Out, Roll In:
  - Swaps out lower-priority processes for higher-priority ones.
- Swap time is proportional to the amount of memory swapped.
- Examples: UNIX uses separate partitions; Windows uses a swap file.

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7. Paging

- Divides memory into fixed-sized frames and logical memory into pages.
- Page Table:
  - Maps logical to physical addresses.
  - Consists of a Page-Table Base Register (PTBR) and Page-Table Length Register (PRLR).
- Address Translation:

    - CPU address split into Page Number (p) and Page Offset (d).
    - Physical address = Base address (from page table) + Offset.
- Translation Lookaside Buffer (TLB):
    - Cache for frequently used page-table entries.
    - Reduces memory access time.

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8. Segmentation

- Divides programs into segments based on logical units (e.g., procedures, arrays).
- Segment Table:
    - Maps segment numbers to physical addresses.
    - Contains:
        - Base: Starting physical address of the segment.
        - Limit: Segment length.
- Segmentation with Paging:
    - Segments are further divided into pages to solve fragmentation issues.
    - Example: MULTICS system.

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9. Virtual Memory

- Allows separation of logical memory from physical memory.
- Demand Paging:
    - Pages loaded only when needed.
    - Reduces memory and I/O requirements.
    - Page Fault:
        - Occurs when a required page is not in memory.
        - Handled by fetching the page from the backing store.
- Page Replacement:
    - Decides which page to replace when memory is full.
    - Uses Modify (Dirty) Bit to minimize overhead.

Page Replacement Algorithms:

1. FIFO: Replaces the oldest page.
2. Optimal: Replaces the page not used for the longest time.

3. LRU: Replaces the least recently accessed page.

MCQ_Que:

Q1.What is operating system?
a.collection of programs that manages hardware resources

b.system service provider to the application programs

c.link to interface the hardware and application programs

d.all of the mentioned

Q2.To access the services of operating system, the interface is provided by the
a.system calls

b.API

c.library

d.assembly instructions

Q3.Which one of the following error will be handle by the operating system?
a.power failure

b.lack of paper in printer

c.connection failure in the network

d.all of the mentioned

Q4.Dual mode operating system of computer system has operations of
a.1mode

b.2modes

c.3modes

d.4modes

Q5.Logical extension of multiprogramming of operating system is

a.time sharing

b.multi tasking

c.single programing

d.both a and b

Q6.What is a shell ?
a.It is a hardware component

b.It is a command interpreter

c.It is a part in compiler

d.It is a tool in CPU scheduling

Q7.The operating system manages _____.
a.Memory

b.Processor

c.Disk and I/O devices

d.All of the above

Q8.The Hardware mechanism that enables a device to notify the CPU is called _____.
a.Polling

b.Interrupt

c.System Call

d.None of the above

Q9.A program at the time of executing is called _____.
a.Dynamic program

b.Static program

c.Binded Program

d.A Process

Q10.The term " Operating System " means _____.

a.A set of programs which controls computer working

b.The way a computer operator works

c.Conversion of high-level language in to machine level language

d.The way a floppy disk drive operates

Q11.The operating system of a computer serves as a software interface between the user and the _____.

a.Hardware

b.Peripheral

c.Memory

d.Screen

Q12.The program is known as _____ which interacts with the inner part of called kernel.
a.Compiler

b.Device Driver

c.Protocol

d.Shell

Q13.Identify the odd thing in the services of operating system.

a.Accounting

b.Protection

c.Error detection and correction

d.Dead lock handling

Q14.Cryptography technique is used in _____.

a.Polling

b.Job Scheduling

c.Protection

d.File Management

Q15.Which technique was introduced because a single job could not keep both the CPU and the I/O devices busy?
a.Time-sharing

b.Spooling

c.Preemptive scheduling

d.Multiprogramming

Q16.Software is a program that directs the overall operation of the computer, facilitates its use and interacts with the user. What are the different types of this software ?
a.Operating system

b.Language Compiler

c.Utilities

d.All of the above

Q17.A _____ is a software that manages the time of a microprocessor to ensure that all time critical events are processed as efficiently as possible. This software allows the system activities to be divided into multiple independent elements called tasks.
a.Kernel

b.Shell

c.Processor

d.Device Driver

Q18.The primary job of the operating system of a computer is to _____.
a.Command Resources

b.Manage Resources

c.Provide Utilities

d.Be user friendly

Q34.
Q19.Who is called a supervisor of computer activity ?
a.CPU

b.Operating system

c.Control unit

d.Application Program

Q20.The kernel of the operating system remains in the primary memory because _____.
a.It is mostly called (used)

b.It manages all interrupt calls

c.It controls all operations in process

d.It is low level

Q21.Multi-programming systems _____.
a.Are easier to develop than single programming systems

b.Execute each job faster

c.Execute more jobs in the same time

d.Are used only on large main frame computers

Q22.Multiprocessing _____.
a.Make the operating system simpler

b.Allows multiple processes to run simultaneously

c.Is completely understood by all major computer vendors

d.Allows the same computer to have the multiple processors

Q23.What is the first step in performing an operating system upgrade ?
a.Partition the drive

b.Format the drive

c.Backup critical data

d.Backup old operating system

Q24.The technique, for sharing the time of a computer among several jobs, which switches jobs so rapidly such that each job appears to have the computer to itself, is called _____.

a.Time Sharing

b.Time out

c.Time domain

d.Multitasking

Q25.It is not the layer of the Operating system.
a.Kernel

b.Shell

c.Application program

d.Critcal Section

Q26.Supervisor state is only allowed to ?
a.Utility Softwares

b.Application Softwares

c.Operating System

d.Guest User

Q27.Which of the following is always there in a computer ?
a.Batch system

b.Operating system

c.Time sharing system

d.Controlling system

Q28.Which is not a function of Kernel ?
a.Process management

b.Memory management

c.File system management

d.All of Above

Q29.Operating system is
a.A collection of hardware components

b.A collection of input output devices

c.A collection of software routines

d.All of above

Q30.Remote computing services involves the use of timesharing and
a.multiprocessing

b.interactive processing

c.batch processing

d.real time processing

Q31.With multiprogramming, _____ is used productively.

a.time

b.space

c.money

d.All of these

Q32.The main function of the command interpreter is
a.To handle the compiler.

b.To handle the parser.

c.To get and execute the next user-specified command.

d.None of the above.

Q33.The volatile storage is/are
a.Main memory

b.Cache

c.Register

d.All of the above.

Q34.The process related to process control, file management, device management, information about system and communication that is requested by any higher level language can be performed by _____.
a.Editors

b.Compilers

c.System Call

d.Caching

Q35.Message passing system allows processes to :
a.communicate with one another without resorting to shared data.

b.communicate with one another by resorting to shared data.

c.share data

d.name the recipient or sender of the message

Q36.When a thread needs to wait for an event it will
a.Block

b.Execute

c.Terminate

d.Update

Q37.In a pure Kernel Level Thread facility all of work of thread management is done by the
a.Application

b.Program

c.Kernel

d.Threads

Q38.What is inter-process communication?
a.communication within the process

b.communication between two process

c.communication between two threads of same process

d.none of the mentioned

Q39.Process State is a part of
a.Process Control block

b.Inode

c.File Allocation Table

d.None of the above

Q40.The kernel keeps track of the state of each task by using a data structure called _____ .
a.Process control block

b.User control block

c.Memory control block

d.None of the above

Q41.A thread is a _____ process .

a.Heavy Weight

b.Mutliprocess

c.Inter Thread

d.Light weight

Q42.Information about a process is maintained in a _____.
a.Stack

b.Translation Lookaside Buffer

c.Process Control Block

d.Program Control Block

Q43.PCB is
a.Program Control Block

b.Process Control Block

c.Process Communication Block

d.None of the above

Q44.Which of the following is contained in Process Control Block (PCB)?
a.Process Number

b.List of Open files

c.Memory Limits

d.All of the Above

Q45.In the running state
a.only the process which has control of the processor is found

b.all the processes waiting for I/O to be completed are found

c.all the processes waiting for the processor are found

d.none of the above

Q46.The kernel keeps track of the state of each task by using a data structure called __
a.Process control block

b.User control block

c.Memory control block

d.None of the above

Q47.A thread
a.is a lightweight process where the context switching is low

b.is a lightweight process where the context swithching is high

c.is used to speed up paging

d.none of the above

Q48.Which is not the state of the process ?
a.Blocked

b.Running

c.Ready

d.Privileged

Q49.A process is
a.program in execution

b.a concurrent program

c.any sequential program

d.something which prevents deadlock

Q50.Which of the following is not the state of a process ?

a.New

b.Old

c.Waiting

d.Running

Q51.The Process Control Block is :
a.Process type variable

b.Data Structure

c.a secondary storage section

d.a Block in memory

Q52.Which of the following do not belong to queues for processes ?
a.Job Queue

b.PCB queue

c.Device Queue

Q53.When the process issues an I/O request :
a.It is placed in an I/O queue

b.It is placed in a waiting queue

c.It is placed in the ready queue

d.It is placed in the Job queue

Q54.When a process terminates :
a.It is removed from all queues

b.It is removed from all, but the job queue

c.Its process control block is de-allocated

d.both a and c

Q55.Which one of the following can not be scheduled by the kernel?
a.kernel level thread

b.user level thread

c.process

d.none of the mentioned

Q56.The two steps of a process execution are :
a.I/O Burst and CPU Burst

b.Memory Burst and OS Burst

c.Memory Burst and CPU Burst

d.None of the above

Q57.Process is .....
a.A program in execution

b.An instance of a program running on a computer

c.The entity that can be assigned to and executed

d.All of the above

Q58.In Priority Scheduling a priority number (integer) is associated with each process. The CPU is allocated to the process with the highest priority (smallest integer = highest priority). The problem of Starvation of low priority processes may never execute, is resolved by _____.
a.Terminating the process

b.Aging

c.Mutual Exclusion

d.Semaphore

Q59.CPU performance is measured through _____.
a.Throughput

b.MHz

c.Flaps

d.None of the above

Q60.With the round robin CPU scheduling in a time-shared system _____.

a.Using very large time slice degenerates in to first come first served algorithm

b.Using extremely small time slices improve performance

c.Using extremely small time slices degenerate in to last in first out algorithm

d.Using medium sized time slices leads to shortest request time first algorithm

Q61.CPU Scheduling is the basis of _____ operating system.
a.Batch

b.Real time

c.Multiprogramming

d.Mono programming

Q62._____ scheduler selects the jobs from the pool of jobs and loads into the ready queue.
a.Long term

b.Short term

c.Medium term

d.None of the above

Q63.In the blocked state
a.the processes waiting for I/O are found

b.the process which is running is found

c.the processes waiting for the processor are found

d.none of the above

Q64.The number of processes completed per unit time is known as _____.
a.Output

b.Throughput

c.Efficiency

d.Capacity

Q65.The collection of processes on the disk that is waiting to be brought into memory for execution forms the _____ .
a.Ready queue

b.Device queue

c.Input queue

d.Priority queue

Q66.Which scheduler controls the degree of multi programming?
a.Short term scheduler

b.Long term scheduler

c.Middle term scheduler

d.None of the above

Q67.A scheduling algorithm is fair
a.if no process faces starvation

b.if a process is starved, detect it and run it with high priority

c.if it uses semaphores

d.only if a queue is used for scheduling

Q68.In a time-sharing operating system, when the time slot given to a process is completed, the process goes from the running state to the :
a.Blocked state

b.Ready state

c.Suspended state

d.Terminated state

Q69.A process said to be in _____ state if it was waiting for an event that will never occur.
a.Safe

b.Unsafe

c.Starvation

d.Dead lock

Q70.In one of the deadlock prevention methods, impose a total ordering of all resource types, and require that each process requests resources in an increasing order of enumeration. This violates the _____ condition of deadlock.
a.Mutual exclusion

b.Hold and Wait

c.Circular Wait

d.No Preemption

Q71.The state of a process after it encounters an I/O instruction is _____.
a.Ready

b.Blocked/Waiting

c.Idle

d.Running

Q72.What is an ISR ?

a.Information Service Request

b.Interrupt Service Request

c.Interrupt Service Routine

d.Information Service Routine

Q73.An interrupt vector

a.is an address that is indexed to an interrupt handler

b.is a unique device number that is indexed by an address

c.is a unique identity given to an interrupt

d.None of these

Q74.DMA is used for :
a.High speed devices(disks and communications network)

b.Low speed devices

c.Saving CPU cycles

d.Both a and c

Q75.In an interrupt driven input/output :
a.the CPU uses polling to watch the control bit constantly, looping to see if device is ready

b.the CPU writes one data byte to the data register and sets a bit in control register to show that a byte is available

c.the CPU receives an interrupt when the device is ready for the next byte

d.the CPU runs a user written code and does accordingly

Q76.Super computers typically employ _____.
a.Real time Operating system

b.Multiprocessors OS

c.desktop OS

d.None of the above

Q77.Distributed systems have ?
a.high security

b.better resource sharing

c.better system utilization

d.low system overhead

Q78.Which amongst the following is not an advantage of Distributed systems?
a.Reliability

b.Incremental growth

c.Resource sharing

d.None of the above

Q79._____ OS pays more attention on the meeting of the time limits.
a.Distributed

b.Network

c.Real time

d.Online

Q80.Real time systems are _____.
a.Primarily used on mainframe computers

b.Used for monitoring events as they occur

c.Used for program development

d.Used for real time interactive users

Q81.In _____ OS, the response time is very critical.
a.Multitasking

b.Batch

c.Online

d.Real-time

Q82.In real time operating system
a.all processes have the same priority

b.a task must be serviced by its deadline period

c.process scheduling can be done only once

d.kernel is not required

Q83.Hard real time operating system has ___ jitter than a soft real time operating system.
a.less

b.more

c.equal

d.none of the mentioned

Q84.For real time operating systems, interrupt latency should be
a.minimal

b.maximum

c.zero

d.dependent on the scheduling

Q85.Real time systems need to _____ the interrupt latency.
a.minimize

b.maximize

c.not bother about

d.none of the mentioned

Q86.Switching the CPU to another Process requires to save state of the old process and loading new process state is called as _____.
a.Process Blocking

b.Context Switch

c.Time Sharing

d.None of the above

Q87.Which of the following is a criterion to evaluate a scheduling algorithm?
a.CPU Utilization: Keep CPU utilization as high as possible

b.Throughput: number of processes completed per unit time

c.Waiting Time: Amount of time spent ready to run but not running

d.All of the above

Q88._____ does the job of allocating a process to the processor.

a.Long term scheduler

b.Short term scheduler

c.Medium term scheduler

d.Dispatcher

Q89.Saving the state of the old process and loading the saved state of the new process is called _____.
a.Context Switch

b.State

c.Multi programming

d.None of the above

Q90.The degree of Multiprogramming is controlled by
a.CPU Scheduler

b.Context Switching

c.Long-term Scheduler

d.Medium term Scheduler

Q91.What is a long-term scheduler ?
a.It selects which process has to be brought into the ready queue

b.It selects which process has to be executed next and allocates CPU

c.It selects which process to remove from memory by swapping

d.None of these

Q92.A major problem with priority scheduling is _____.
a.Definite blocking

b.Starvation

c.Low priority

d.None of the above

Q93.The host repeatedly checks if the controller is busy until it is not. It is in a loop that status register's busy bit becomes clear. This is called _____ and a mechanism for the hardware controller to notify the CPU that it is ready is called _____.
a.Interrupt and Polling

b.Polling and Spooling

c.Polling and Interrupt

d.Deadlock and Starvation

Q94.An optimal scheduling algorithm in terms of minimizing the average waiting time of a given set of processes is _____.
a.FCFS scheduling algorithm

b.Round robin scheduling algorithm

c.Shorest job - first scheduling algorithm

d.None of the above

Q95.In Priority Scheduling a priority number (integer) is associated with each process. The CPU is allocated to the process with the highest priority (smallest integer = highest priority). The problem of Starvation of low priority processes may never execute, is resolved by _____.
a.Terminating the process

b.Aging

c.Mutual Exclusion

d.Semaphore

Q96.With the round robin CPU scheduling in a time-shared system _____.
a.Using very large time slice degenerates in to first come first served algorithm

b.Using extremely small time slices improve performance

c.Using extremely small time slices degenerate in to last in first out algorithm

d.Using medium sized time slices leads to shortest request time first algorithm

Q97.Which of the following is a criterion to evaluate a scheduling algorithm?
a.CPU Utilization: Keep CPU utilization as high as possible

b.Throughput: number of processes completed per unit time

c.Waiting Time: Amount of time spent ready to run but not running

d.All of the above

Q98._____ does the job of allocating a process to the processor.
a.Long term scheduler

b.Short term scheduler

c.Medium term scheduler

d.Dispatcher

Q99.In interactive environments such as time-sharing systems, the primary requirement is to provide reasonably good response time and in general, to share system resources equitably. In such situations, the scheduling algorithm that is most popularly applied is _____.
a.Shortest Remaining Time Next (SRTN) Scheduling

b.Priority Based Preemptive Scheduling

c.Round Robin Scheduling

d.None of the above

Q100.In the multi-programming environment, the main memory consisting of _____ number of process.

a.Greater than 100

b.Only one

c.Greater than 50

d.More than one

Q101.Saving the state of the old process and loading the saved state of the new process is called _____.

a.Context Switch

b.State

c.Multi programming

d.None of the above

Q102.Round robin scheduling is essentially the preemptive version of _____.

a.FIFO

b.Shortest job first

c.Shortes remaining

d.Longest time first

Q103.The collection of processes on the disk that is waiting to be brought into memory for execution forms the _____ .
a.Ready queue

b.Device queue

c.Input queue

d.Priority queue

Q104.Which scheduler controls the degree of multi programming?
a.Short term scheduler

b.Long term scheduler

c.Middle term scheduler

d.None of the above

Q105.A scheduling algorithm is fair
a.if no process faces starvation

b.if a process is starved, detect it and run it with high priority

c.if it uses semaphores

d.only if a queue is used for scheduling

Q106.What is a long-term scheduler ?
a.It selects which process has to be brought into the ready queue

b.It selects which process has to be executed next and allocates CPU

c.It selects which process to remove from memory by swapping

d.None of these

Q107.The only state transition that is initiated by the user process itself is :
a.block

b.wakeup

c.dispatch

d.None of these

Q108.In a time-sharing operating system, when the time slot given to a process is completed, the process goes from the running state to the :
a.Blocked state

b.Ready state

c.Suspended state

d.Terminated state

Q109.In a multi-programming environment :

a.the processor executes more than one process at a time

b.the programs are developed by more than one person

c.more than one process resides in the memory

d.a single user can execute many programs at the same time

Q110.Suppose that a process is in “Blocked” state waiting for some I/O service. When the service is completed, it goes to the :
a.Running state

b.Ready state

c.Suspended state

d.Terminated state

Q111.The context of a process in the PCB of a process does not contain :
a.the value of the CPU registers

b.the process state

c.memory-management information

d.context switch time

Q112.Which of the following does not interrupt a running process ?
a.A device

b.Timer

c.Scheduler process

d.Power failure

Q113.Which of the following state transitions is not possible ?
a.blocked to running

b.ready to running

c.blocked to ready

d.running to blocked

Q114.Which scheduling policy is most suitable for time shared operating system ?
a.Shortest job first

b.FCFS

c.LCFS

d.Round robin

Q115.Which among following scheduling algorithms give minimum average waiting time
a.FCFS

b.SJF

c.Round robin

d.On priority

Q116.In which scheduling policies, context switching never takes place
a.FCFS

b.round robin

c.Shortest job first

d.Pre-empitive

Q117.Dispatcher function is to
a.put tasks in I/O wait

b.schedule tasks in processor

c.change task priorities

d.All of above

Q118.Shortest Job First executes first the job
a.with the least processor needs

b.that first entered the queue

c.that has been in the queue for the longest

d.that last entered the queue

Q119.Which is non pre-emptive
a.Round robin

b.FIFO

c.MQS

d.MQSF

Q120.Which scheduling algorithm allocates the CPU first to the process that requests the CPU first?
a.first-come, first-served scheduling

b.shortest job scheduling

c.priority scheduling

d.none of the mentioned

Q121.Time quantum is defined in
a.shortest job scheduling algorithm

b.round robin scheduling algorithm

c.priority scheduling algorithm

d.multilevel queue scheduling algorithm

Q122.Scheduling is done so as to:
a.increase the turnaround time

b.decrease the turnaround time

c.keep the turnaround time same

d.there is no relation between scheduling and turnaround time

Q123.Waiting time is :
a.the total time in the blocked and waiting queues

b.the total time spent in the ready queue

c.the total time spent in the running queue

d.the total time from the completion till the submission of a process

Q124.Response time is :
a.the total time taken from the submission time till the completion time

b.the total time taken from the submission time till the first response is produced

c.the total time taken from submission time till the response is output

d.None of these

Q125.To purpose of CPU Scheduling is:
a.increase the response time

b.keep the response time the same

c.decrease the response time

d.None of these

Q126.Round robin scheduling falls under the category of :
a.Non preemptive scheduling

b.Preemptive scheduling

c.Both of the above

d.None of the above

Q127.With round robin scheduling algorithm in a time shared system,
a.using very large time slices converts it into First come First served scheduling algorithm

b.using very small time slices converts it into First come First served scheduling algorithm

c.using extremely small time slices increases performance

d.using very small time slices converts it into Shortest Job First algorithm

Q128.The FIFO algorithm :
a.first executes the job that came in last in the queue

b.first executes the job that came in first in the queue

c.first executes the job that needs minimal processor

d.first executes the job that has maximum processor needs

Q129.Which of the following statements are true ?
I. Shortest remaining time first scheduling may cause starvation
II. Preemptive scheduling may cause starvation
III. Round robin is better than FCFS in terms of response time
a.I only

b.I and III only

c.II and III only

d.I, II and III

Q130.The most optimal scheduling algorithm is :
a.FCFS – First come First served

b.SJF – Shortest Job First

c.RR – Round Robin

d.None of these

Q131.Consider the following set of processes, the length of the CPU burst time given in milliseconds :
Process Burst time
P1 6
P2 8
P3 7
P4 3
i) Assuming the above process being scheduled with the SJF scheduling algorithm :
a.The waiting time for process P1 is 3ms.

b.The waiting time for process P1 is 0ms.

c.The waiting time for process P1 is 16ms.

d.The waiting time for process P1 is 9ms.

Q132.Consider the following set of processes, the length of the CPU burst time given in milliseconds :
Process Burst time
P1 6
P2 8
P3 7
P4 3
Assuming the above process being scheduled with the SJF scheduling algorithm :
a.The waiting time for process P2 is 3ms.

b.The waiting time for process P2 is 0ms.

c.The waiting time for process P2 is 16ms.

d.The waiting time for process P2 is 9ms.

Q133.Consider the following set of processes, the length of the CPU burst time given in milliseconds :
Process Burst time
P1 6
P2 8
P3 7

P4 3
Assuming the above process being scheduled with the SJF scheduling algorithm:

a.The waiting time for process P4 is 3ms.

b.The waiting time for process P4 is 0ms.

c.The waiting time for process P4 is 16ms.

d.The waiting time for process P4 is 9ms.

Q134.Consider the following set of processes, the length of the CPU burst time given in milliseconds :
Process Burst time
P1 6
P2 8
P3 7
P4 3
Assuming the above process being scheduled with the SJF scheduling algorithm :
a.The waiting time for process P3 is 3ms.

b.The waiting time for process P3 is 0ms.

c.The waiting time for process P3 is 16ms.

d.The waiting time for process P3 is 9ms.

Q135.One of the disadvantages of the priority scheduling algorithm is that :

a.it schedules in a very complex manner

b.its scheduling takes up a lot of time

c.it can lead to some low priority process waiting indefinitely for the CPU

d.None of these

Q136.'Aging' is :
a.keeping track of cache contents

b.keeping track of what pages are currently residing in memory

c.keeping track of how many times a given page is referenced

d.increasing the priority of jobs to ensure termination in a finite time

Q137.A solution to the problem of indefinite blockage of low – priority processes is :
a.Starvation

b.Wait queue

c.Ready queue

d.Aging

Q138.Consider a uniprocessor computer system that has 2 processes and both of them alternate 10ms CPU bursts with 90ms I / O bursts. Both the processes were created at nearly the same time and can proceed in parallel. What is the scheduling strategy for this system that will result in the least CPU utilization (over a long period of time) ?
a.Round Robin scheduling with a time quantum of 5ms

b.First Come First Served scheduling

c.Shortest remaining time first

d.Static priority scheduling with different priorities for the two processes

Q139.We have a uniprocessor machine where a set of n tasks with known run times r1, r2, r3,….rn are to be run. What will be the maximum throughput result of the processor scheduling algorithm?
a.Shortest Job First

b.First Come First Served

c.Round Robin

d.Highest Response Ratio Next

Q140.Three CPU intensive processes requires 10, 20 and 30 time units and arrive at times 0, 2 and 6 respectively. The operating system implements a shortest remaining time first scheduling algorithm. Considering that the context switches at time zero and at the end are not counted the number of context switches are needed is _____.

a.4

b.3

c.2

d.1

Q141.Program ‘preemption’ is
a.forced de allocation of the CPU from a program which is executing on the CPU.

b.release of CPU by the program after completing its task.

c.forced allotment of CPU by a program to itself.

d.a program terminating itself due to detection of an error.

Q142._____ is a technique of improving the priority of process waiting in Queue for CPU allocation.
a.Starvation

b.Ageing

c.Revocation

d.Relocation

Q143..... refers to a situation in which a process is ready to execute but is continuously denied access to a processor in deference to other processes.
a.Synchronization

b.Mutual Exclusion

c.Dead lock

d.Starvation

Q144.Which of the following are the states of a five state process model?

i) Running ii) Ready iii) New iv) Exit v) Destroy

a.i, ii, iii and v only

b.i, ii, iv and v only

c.i, ii, iii, and iv only

d.All i, ii, iii, iv and v

Q145.State which statement is true for Suspended process?

i) The process is not immediately available for execution.
ii) The process may be removed from suspended state automatically without removal order.

a.i only

b.ii only

c.i and ii only

d.None of the above

Q146.In process scheduling, …… determines when new processes are admitted to the system.

a.long term scheduling

b.medium term scheduling

c.short term scheduling

d.none of the above

Q147.In process scheduling, …… determines which ready process will be executed next by processor.
a.long term scheduling

b.medium term scheduling

c.short term scheduling

d.none of the above

Q148.With deadlock detection, requested resources are granted to

a.Resources

b.Programs

c.Processes

d.Users

Q149.A set of processes is deadlock if
a.each process is blocked and will remain so forever

b.each process is terminated

c.all processes are trying to kill each other

d.none of the mentioned

Q150.A process said to be in _____ state if it was waiting for an event that will never occur.
a.Safe

b.Unsafe

c.Starvation

d.Dead lock

Q151.Resource locking _____.
a.Allows multiple tasks to simultaneously use resourc

b.Forces only one task to use any resource at any time

c.Can easily cause a dead lock condition

d.Is not used for disk drives

Q152.A set of resources' allocations such that the system can allocate resources to each process in some order, and still avoid a deadlock is called _____.

a.Unsafe state

b.Safe state

c.Starvation

d.Greeedy allocation

Q153.A process is starved

a.if it is permanently waiting for a resource

b.if semaphores are not used

c.if a queue is not used for scheduling

d.if demand paging is not properly implemented

Q154.The state of a process after it encounters an I/O instruction is _____.

a.Ready

b.Blocked/Waiting

c.Idle

d.Running

Q155.Semophores are used to solve the problem of

a.race condition

b.process synchronization

c.mutual exclusion

d.belady problem

Q156.Semaphores function is to

a.synchronize critical resources to prevent deadlock

b.synchronize processes for better CPU utilization

c.used for memory management

d.none of above

Q157.Four necessary conditions for deadlock are non pre-emption, circular wait, hold and wait and
a.mutual exclusion

b.race condition

c.buffer overflow

d.None of above

Q158.A problem encountered in multitasking when a process is perpetually denied necessary resources is called
a.deadlock

b.starvation

c.inversion

d.aging

Q159.To avoid deadlock

a.there must be a fixed number of resources to allocate

b.resource allocation must be done only once

c.all deadlocked processes must be aborted

d.inversion technique can be used

Q160.The number of resources requested by a process :

a.must always be less than the total number of resources available in the system

b.must always be equal to the total number of resources available in the system

c.must not exceed the total number of resources available in the system

d.must exceed the total number of resources available in the system

Q161.The wait-for graph is a deadlock detection algorithm that is applicable when :
a.all resources have a single instance

b.all resources have multiple instances

c.all resources have a single 7 multiple instance

d.all of the mentioned

Q162.If the wait for graph contains a cycle :
a.then a deadlock does not exist

b.then a deadlock exists

c.then the system is in a safe state

d.either deadlock exists or system is in a safe state

Q163.A deadlock can be broken by :
a.abort one or more processes to break the circular wait

b.abort all the process in the system

c.preempt all resources from all processes

d.none of the mentioned

Q164.In memory management , a technique called as paging, physical memory is broken into fixed-sized blocks called _____.
a.Pages

b.Frames

c.Blocks

d.Segments

Q165.Memory protection is normally done by
a.the processor and the associated hardware

b.the operating system

c.the compiler

d.the user program

Q166.CPU can access which type of memory directly?
a.random-access memory

b.magnetic disk

c.magnetic tape

d.None of the above

Q167.What works on the principle of locality?

a.Cache memory

b.Interrupts

c.Polling

d.DMA

Q168.The memory allocation scheme subject to “external” fragmentation is
a.segmentation

b.swapping

c.pure demand paging

d.multiple fixed contiguous partitions

Q169.The different types of tables maintained by the operating system are .....
a.memory, logical , I/O file

b.memory, I/O, file, physical

c.memory, I/O, file, process

d.memory, logical, I/O, physical

Q170.Which of the following information not included in memory table ?
a.The allocation of main memory to process

b.The allocation of secondary memory to process

c.Any information needed to manage virtual memory

d.Any information about the existence of file

Q171.Memory management is
a.not used in modern operating system

b.replaced with virtual memory on current system

c.not used on multiprogramming systems

d.critical for even the simplest operating system

Q172.Run time mapping from virtual to physical address is done by
a.Memory management unit

b.CPU

c.PCI

d.None of the mentioned

Q173.Memory management technique in which system stores and retrieves data from secondary storage for use in main memory is called
a.fragmentation

b.paging

c.mapping

d.none of the mentioned

Q174.Program always deals with
a.logical address

b.absolute address

c.physical address

d.relative address

Q175.The page table contains
a.base address of each page in physical memory

b.page offset

c.page size

d.none of the mentioned

Q176.What is compaction?
a.a technique for overcoming internal fragmentation

b.a paging technique

c.a technique for overcoming external fragmentation

d.a technique for overcoming fatal error

Q177.Operating System maintains the page table for
a.each process

b.each thread

c.each instruction

d.each address

Q178.The main memory accommodates :
a.operating system

b.cpu

c.user processes

d.all of the mentioned

Q179.The operating system is :
a.in the low memory

b.in the high memory

c.either low or high memory (depending on the location of interrupt vector)

d.none of the mentioned

Q180.In contiguous memory allocation :
a.each process is contained in a single contiguous section of memory

b.all processes are contained in a single contiguous section of memory

c.the memory space is contiguous

d.none of the mentioned

Q181.When memory is divided into several fixed sized partitions, each partition may contain _____
a.exactly one process

b.at least one process

c.multiple processes at once

d.none of the mentioned

Q182.In fixed sized partition, the degree of multi programming is bounded by _____
a.the number of partitions

b.the CPU utilization

c.the memory size

d.all of the mentioned

Q183.The first fit, best fit and worst fit are strategies to select a _____
a.process from a queue to put in memory

b.processor to run the next process

c.free hole from a set of available holes

d.all of the mentioned

Q184.In internal fragmentation, memory is internal to a partition and :
a.is being used

b.is not being used

c.is always used

d.none of the mentioned

Q185.A solution to the problem of external fragmentation is :
a.compaction

b.larger memory space

c.smaller memory space

d.none of the mentioned

Q186.Another solution to the problem of external fragmentation problem is to :
a.permit the logical address space of a process to be noncontiguous

b.permit smaller processes to be allocated memory at last

c.permit larger processes to be allocated memory at last

d.all of the mentioned

Q187.If relocation is static and is done at assembly or load time, compaction _____
a.cannot be done

b.must be done

c.must not be done

d.can be done

Q188.The disadvantage of moving all process to one end of memory and all holes to the other direction, producing one large hole of available memory is :
a.the cost incurred

b.the memory used

c.the CPU used

d.all of the mentioned

Q189._____ is generally faster than _____ and _____
a.first fit, best fit, worst fit

b.best fit, first fit, worst fit

c.worst fit, best fit, first fit

d.none of the mentioned

Q190.External fragmentation exists when :
a.enough total memory exists to satisfy a request but it is not contiguous

b.the total memory is insufficient to satisfy a request

c.a request cannot be satisfied even when the total memory is free

d.none of the mentioned

Q191.External fragmentation will not occur when :

a.first fit is used

b.best fit is used

c.worst fit is used

d.no matter which algorithm is used, it will always occur

Q192.Sometimes the overhead of keeping track of a hole might be :
a.larger than the memory

b.larger than the hole itself

c.very small

d.all of the mentioned

Q193.When the memory allocated to a process is slightly larger than the process, then :
a.internal fragmentation occurs

b.external fragmentation occurs

c.both internal and external fragmentation occurs

d.neither internal nor external fragmentation occurs

Q194.Physical memory is broken into fixed-sized blocks called _____
a.frames

b.pages

c.backing store

d.none of the mentioned

Q195.Logical memory is broken into blocks of the same size called _____
a.frames

b.pages

c.backing store

d.none of the mentioned

Q196.Every address generated by the CPU is divided into two parts :
a.frame bit & page number

b.page number & page offset

c.page offset & frame bit

d.frame offset & page offset

Q197.The _____ is used as an index into the page table.

a.frame bit

b.page number

c.page offset

d.frame offset

Q198.The _____ table contains the base address of each page in physical memory.

a.process

b.memory

c.page

d.frame

Q199.The size of a page is typically :
a.varied

b.power of 2

c.power of 4

d.none of the mentioned

Q200.With paging there is no _____ fragmentation.
a.internal

b.external

c.either type of

d.none of the mentioned

Q201.The operating system maintains a _____ table that keeps track of how many frames have been allocated, how many are there, and how many are available.
a.page

b.mapping

c.frame

d.memory

Q202.Paging increases the _____ time.
a.waiting

b.execution

c.context – switch

d.all of the mentioned

Q203.Paging _____.
a.solves the memory fragmentation problem

b.allows modular programming

c.allows structured programming

d.avoids deadlock

Q204.Thrashing occurs _____.
a.when excessive swapping takes place

b.when you thrash your computer

c.whenever deadlock occurs

d.when no swapping takes place

Q205.Thrashing _____.
a.Reduces page I/O

b.Decreases the degree of multiprogramming

c.Implies excessive page I/O

d.Improve the system performance

Q206.If the property of locality of reference is well pronounced in a program
a.the number of page faults will be more

b.the number of page faults will be less

c.the number of page faults will same

d.none of above

Q207.Which scheduler performs the "swapping out" or "swapping in"?
a.Long-term scheduling

b.Medium-term scheduling

c.Short-term scheduling

d.None of the above.

Q208.Which technique is used to temporarily removing non-active programs from the memory of computer system?
a.Swapping

b.Spooling

c.Scheduler

d.None of the above.

Q209.Where does the swap space reside?

a.Disk

b.ROM

c.RAM

d.On - chip cache

Q210.Which of the following is / are the essential contents in each entry of a page table?
a.Page frame number

b.Virtual page number

c.Access right information

d.Both page frame number and virtual page number

Q211.The term 'page traffic' describes
a.number of pages in memory at a given instant.

b.number of papers required to be brought in at a given page request.

c.the movement of pages in and out of memory.

d.number of pages of executing programs loaded in memory.

Q212.Poor response time is usually caused by
a.Process busy

b.High I/O rates

c.High paging rates

d.Any of the above

Q213._____ is a technique of temporarily removing inactive programs from the memory of computer system
a.Swapping

b.Spooling

c.Semaphore

d.Scheduler

Q214.State true of false.

i) With paging, each process is divided into relatively small, fixed-size pages.
ii) Segmentation provides for the use of pieces of varying size.
a.True, False

b.True, True

c.False, True

d.False, False

Q215.Moving Process from main memory to disk is called

a.scheduling

b.caching

c.swapping

d.spooling

Q216.Address Binding is :
a.going to an address in memory

b.locating an address with the help of another address

c.binding two addresses together to form a new address in a different memory space

d.a mapping from one address space to another

Q217.Binding of instructions and data to memory addresses can be done at :
a.Compile time

b.Load time

c.Execution time

d.All of the mentioned

Q218.If the process can be moved during its execution from one memory segment to another, then binding must be :
a.delayed until run time

b.preponed to compile time

c.preponed to load time

d.none of the mentioned

Q219.Dynamic loading is :
a.loading multiple routines dynamically

b.loading a routine only when it is called

c.loading multiple routines randomly

d.none of the mentioned

Q220.The advantage of dynamic loading is that :
a.A used routine is used multiple times

b.An unused routine is never loaded

c.CPU utilization increases

d.All of the mentioned

Q221.The idea of overlays is to :

a.data that are needed at any given time

b.enable a process to be larger than the amount of memory allocated to it

c.keep in memory only those instructions

d.all of the mentioned

Q222.The _____ must design and program the overlay structure.
a.programmer

b.system architect

c.system designer

d.none of the mentioned

Q223.The _____ swaps processes in and out of the memory.
a.Memory manager

b.CPU

c.CPU manager

d.User

Q224.If binding is done at assembly or load time, then the process _____ be moved to different locations after being swapped out and in again.
a.can

b.must

c.can never

d.may

Q225.In a system that does not support swapping,
a.the compiler normally binds symbolic addresses (variables) to relocatable addresses

b.the compiler normally binds symbolic addresses to physical addresses

c.the loader binds relocatable addresses to physical addresses

d.binding of symbolic addresses to physical addresses normally takes place during execution

Q226.The address generated by the CPU is referred to as :

a.Physical address

b.Logical address

c.Neither physical nor logical

d.None of the mentioned

Q227.The address loaded into the memory address register of the memory is referred to as :
a.Physical address

b.Logical address

c.Neither physical nor logical

d.None of the mentioned

Q228.The run time mapping from virtual to physical addresses is done by a hardware device called the :
a.Virtual to physical mapper

b.Memory management unit

c.Memory mapping unit

d.None of the mentioned

Q229.The size of a process is limited to the size of :
a.physical memory

b.external storage

c.secondary storage

d.none of the mentioned

Q230.If execution time binding is being used, then a process _____ be swapped to a different memory space.
a.has to be

b.can never

c.must

d.may

Q231.Swapping requires a _____
a.motherboard

b.keyboard

c.monitor

d.backing store

Q232.The _____ time in a swap out of a running process and swap in of a new process into the memory is very high.

a.context – switch

b.waiting

c.execution

d.all of the mentioned

Q233.The major part of swap time is _____ time.

a.waiting

b.transfer

c.execution

d.none of the mentioned

Q234.Swapping _____ be done when a process has pending I/O, or has to execute I/O operations only into operating system buffers.

a.must

b.can

c.must never

d.maybe

Q235.Swap space is allocated :
a.as a chunk of disk

b.separate from a file system

c.into a file system

d.all of the mentioned

Q236.Which of the following is TRUE ?

a.Overlays are used to increase the size of physical memory

b.Overlays are used to increase the logical address space

c.When overlays are used, the size of a process is not limited to the size of the physical memory

d.Overlays are used whenever the physical address space is smaller than the logical address space

Q237.Swapping

a.works best with many small partitions

b.allows many programs to use memory simultaneously

c.allows each program in turn to use the memory

d.does not work with overlaying

Q238.Memory tables are used to keep track of
a.Real and Virtual Memory

b.I/O Devices

c.Resources

d.I/O Modules

Q239.Virtual Memory is commonly implemented by _____.
a.Segmentation

b.Swapping

c.Demand Paging

d.None of the above

Q240.Virtual memory is _____.
a.An extremely large main memory

b.An extremely large secondary memory

c.An illusion of extremely large main memory

d.A type of memory used in super computers

Q241.The high paging activity is called _____.

a.Inter process communication

b.Thrashing

c.Context Switch

d.None of the above

Q242.In a virtual memory environment

a.segmentation and page tables are stored in the cache and do not add any substantial overhead

b.slow down the computer system considerable

c.segmentation and page tables are stored in the RAM

d.none of the above

Q243.The mechanism that bring a page into memory only when it is needed is called _____

a.Segmentation

b.Fragmentation

c.Demand Paging

d.Page Replacement

Q244.Demand paged memory allocation
a.allows the virtual address space to be independent of the physical memory

b.allows the virtual address space to be a multiple of the physical memory size

c.allows deadlock tobe detected in paging schemes

d.is present only in Windows NT

Q245.What is a page fault ?
a.is an spelling error in a page in memory

b.is a reference to a page which is in another program

c.is an access to a page not currently in memory

d.always occurs whenever a page is accessed

Q246.Size of virtual memory depends on
a.size of data bus

b.size of address bus

c.size of main memory

d.none of above

Q247.If hardware does not support _____ then a multi - user and multi - processing operating system cannot be implemented.
a.At least two modes of CPU execution

b.Demand paging

c.DMA for disk transfer

d.Address translation

Q248.A set of techniques that allow to execute a program which is not entirely in memory is called
a.demand paging

b.virtual memory

c.auxiliary memory

d.secondary memory

Q249.Page fault frequency in an operating system is reduced when the

a.processes tend to the I/O-bound

b.size of pages is reduced

c.processes tend to be CPU-bound

d.locality of reference is applicable to the process

Q250.Virtual memory can be implemented with
a.Segmentation

b.Paging

c.None of the above

d.Both of the above

Q251.A process that execute only in main memory is referred to as …… and that allocated in disk is referred to a …….
a.virtual memory, true memory

b.virtual memory, real memory

c.real memory, virtual memory

d.imaginary memory, real memory

Q252.Paging
a.is a method of memory allocation by which the program is subdivided into equal portions, or pages and core is subdivided into equal portions or blocks.

b.consists of those addresses that may be generated by a processor during execution of a computation.

c.is a method of allocating processor time.

d.allows multiple programs to reside in separate areas of core at the time.

Q253.Virtual Memory
a.is a method of memory allocation by which the program is subdivided into equal portions, or pages and core is subdivided into equal portions or blocks.

b.consists of those addresses that may be generated by a processor during execution of a computation.

c.is a method of allocating processor time.

d.allows multiple programs to reside in separate areas of core at the time.

Q254.Paging is implemented in
a.Operating System

b.Hardware

c.Software

d.All of them

Q255.Page-Table length register (PTLR) indicates size of
a.Page Table

b.Paging File

c.Main Memory

d.Virtual Memory

Q256.Dived logical memory into blocks with the same size as frames are called

a.Pages

b.Frames

c.Page Table

d.Segmentation

Q257.Which memory allocation policy allocate the largest hole to the process?

a.Best-Fit

b.Worst-Fit

c.First-Fit

d.None of them

Q258.When there is enough memory to fit a process in memory, but the space is not contiguous we need

a.Internal Fragmentation

b.Virtual Fragmentation

c.External Fragmentation

d.None of them

Q259.The problem of thrashing is effected scientifically by _____.
a.Program structure

b.Program size

c.Primary storage size

d.None of the above

Q260._____ allocates the largest hole (free fragment) available in the memory.
a.Best Fit

b.Worst Fit

c.First Fit

d.None of the above

Q261.If all page frames are initially empty, and a process is allocated 3 page frames in real memory and references its pages in the order 1 2 3 2 4 5 2 3 2 4 1 and the page replacement is FIFO, the total number of page faults caused by the process will be _____.
a.10

b.7

c.8

d.9

Q262.A page fault occurs
a.when the page is not in the memory

b.when the page is in the memory

c.when the process enters the blocked state

d.when the process is in the ready state

Q263.The LRU algorithm

a.pages out pages that have been used recently

b.pages out pages that have not been used recently

c.pages out pages that have been least used recently

d.pages out the first page in a given area

Q264.Operating system supports different page replacement policy. From the given below option which is not a valid page replacement policy?
a.Least Recently Used

b.First in first out

c.Currently used policy

d.Optimal page replacement policy

Q265.The optimal page replacement algorithm will select the page that
a.has been used least number of times.

b.has been used most number of times.

c.has been used for the longest time in the past.

d.will not be used for the longest time in future.

Q266.When size of the memory is increased the page replacement policy that sometimes leads to more page faults is called _____ .
a.FIFO

b.Optimal

c.LRU

d.None of the above

Q267.We have a process that has been allocated 3 page frames and initially none of the pages of the process are available in the memory. The following sequence of page references (reference string) is made by the process :

1, 2, 1, 3, 7, 4, 5, 6, 3, 1
If Optimal Page Replacement policy is used, _____ page faults will occur for the above reference string.
a.7

b.8

c.9

d.6

Q268.'LRU' page replacement policy is

a.Last Replaced Unit.

b.Last Restored Unit.

c.Least Recently Used.

d.Least Required Unit.

Q269.Which of the following statements is false ?
a.the technique of storage compaction involves moving all occupied areas of storage to one end or other of main storage

b.compaction does not involve relocation of programs

c.compaction is also know as garbage collection

d.the system must stop everything while it performs the compaction

Ans:

1.	d
2.	a
3.	d
4.	b
5.	d
6.	b

7. d
8. b
9. d
10. a
11. a
12. d
13. c
14. c
15. d
16. d
17. a
18. b
19. b
20. a
21. c
22. d
23. c
24. a
25. d
26. c
27. b
28. d
29. c
30. c
31. a
32. c
33. d
34. c
35. a
36. a
37. c
38. b
39. a
40. a

41. d
42. c
43. b
44. d
45. a
46. a
47. a
48. d
49. a
50. b
51. b
52. b
53. a
54. d
55. b
56. a
57. d
58. b
59. a
60. a
61. c
62. a
63. a
64. b
65. c
66. b
67. a
68. b
69. d
70. c
71. b
72. c
73. a
74. d

75. c
76. b
77. b
78. a
79. c
80. b
81. d
82. b
83. a
84. a
85. a
86. b
87. d
88. d
89. a
90. c
91. a
92. b
93. c
94. c
95. b
96. a
97. d
98. d
99. c
100. d
101. a
102. a
103. c
104. b
105. a
106. a
107. a
108. b

109. c
110. b
111. d
112. c
113. a
114. d
115. b
116. a
117. a
118. a
119. b
120. a
121. b
122. b
123. b
124. b
125. c
126. b
127. a
128. b
129. d
130. b
131. a
132. c
133. b
134. d
135. c
136. d
137. d
138. a
139. a
140. c
141. a
142. b

143. d
144. c
145. a
146. a
147. c
148. c
149. a
150. d
151. b
152. b
153. a
154. b
155. c
156. a
157. a
158. b
159. a
160. c
161. a
162. b
163. a
164. b
165. a
166. a
167. a
168. a
169. c
170. d
171. b
172. a
173. b
174. a
175. a
176. c

177. a
178. a
179. c
180. a
181. a
182. a
183. c
184. b
185. a
186. a
187. a
188. a
189. a
190. a
191. d
192. b
193. a
194. a
195. b
196. b
197. b
198. c
199. b
200. b
201. c
202. c
203. a
204. a
205. c
206. b
207. b
208. a
209. a
210. a

211. c
212. d
213. a
214. b
215. c
216. d
217. d
218. a
219. b
220. b
221. d
222. a
223. a
224. c
225. a
226. b
227. a
228. b
229. a
230. d
231. d
232. a
233. b
234. c
235. a
236. c
237. c
238. a
239. c
240. c
241. b
242. c
243. c
244. a

245. c
246. b
247. b
248. b
249. d
250. d
251. c
252. a
253. b
254. b
255. a
256. a
257. b
258. c
259. a
260. b
261. d
262. a
263. c
264. c
265. d
266. a
267. a
268. c
269. b

SIM_MID_2022:

Questions with Chosen Options:

1. Information about a process is maintained in a:

a) Stack

b) Translation lookaside buffer

c) Process Control Block

d) Program control Block

2. Real-time systems are:

a) Primarily used on mainframe computers

b) Used for monitoring events as they occur

c) Used for program development

d) Used for real-time interactive users

3. PCB is:

a) Program Control Block

b) Process Control Block

c) Process Communication Block

d) None of the above

4. Inter-process communication can be done through:

a) Mails

b) Messages

c) System calls

d) Traps

5. What is an operating system?

a) Collection of programs that manages hardware resources

b) System service provider to the application programs

c) Link to interface the hardware and application programs

d) All of the mentioned

6. Which of the following is contained in a Process Control Block (PCB)?

a) Process Number

b) List of Open files

c) Memory Limits

d) All of the Above

7. To access the services of the operating system, the interface is provided by the:

a) System calls

b) API

c) Library

d) Assembly instructions

8. A software that manages the time of a microprocessor is called:

a) Kernel

b) Shell

c) Processor

d) Device Driver

9. Supercomputers typically employ:

a) Real-time Operating system

b) Multiprocessors OS

c) Desktop OS

d) None of the above

10. The process-related activities can be performed by:

a) Editors

b) Compilers

c) System Call

d) Caching

11. What is a shell?

a) It is a hardware component

b) It is a command interpreter

c) It is a part in compiler

d) It is a tool in CPU scheduling

12. The operating system manages:

a) Memory

b) Processor

c) Disk and I/O devices

d) All of the above

13. The hardware mechanism that enables a device to notify the CPU is called:

a) Polling

b) Interrupt

c) System call

d) None of the above

14. In Unix, which system call creates a new process?

a) Fork

b) Create

c) New

d) None of the mentioned

15. Process state is a part of:

a) Process Control Block

b) Inode

c) File Allocation Table

d) None of the above

16. Switching the CPU to another process is called:

a) Process Blocking

b) Context Switch

c) Time sharing

d) None of the above

17. In the running state:

a) Only the process which has control of the processor is found

b) All the processes waiting for I/O to be completed are found

c) All the processes waiting for the processor are found

d) None of the above

18. The OS that focuses on meeting time limits is:

a) Distributed

b) Network

c) Real-time

d) Online

19. What is inter-process communication?

a) Communication within the process

b) Communication between two processes

c) Communication between two threads of the same process

d) None of the mentioned

20. A thread is a:

a) Heavyweight process

b) Multiprocess

c) Inter Thread

d) Lightweight process

21. In a pure Kernel Level Thread facility, thread management is done by the:

a) Application

b) Program

c) Kernel

d) Threads

22. The technique for sharing computer time among jobs is called:

a) Time sharing

b) Time out

c) Time domain

d) Multitasking

23. Which scheduler controls the degree of multi-programming?

a) Short-term scheduler (STS)

b) Long-term scheduler (LTS)

c) Middle-term scheduler

d) None of the above

24. A process is:

a) Program in execution

b) A concurrent program

c) Any sequential program

d) Something which prevents deadlock

25. The state of a process after it encounters an I/O instruction is:

a) Ready

b) Blocked/Waiting

c) Idle

d) Running

26. The kernel keeps track of tasks using:

a) Process control block

b) User control block

c) Memory control block

d) None of the above

27. Which is not a state of the process?

a) Blocked

b) Running

c) Ready

d) Privileged

28. The process that spends most of its time on the CPU is called:

a) Lightweight process

b) Heavyweight process

c) I/O-bound process

d) CPU-bound process

29. When a thread needs to wait for an event, it will:

a) Block

b) Execute

c) Terminate

d) Update

30. In a real-time OS, the response time is:

a) Multitasking

b) Batch

c) Online

d) Real-time

31.The process that spends most of its time on I/O devices is called:

a) Lightweight process

b) Heavyweight process

c) I/O-bound process

d) CPU-bound process

32. In a real-time operating system:

a) All processes have the same priority

b) A task must be serviced by its deadline period

c) Process scheduling can be done only once

d) Kernel is not required

33. Main memory of the computer system is also called:

a) Non-volatile

b) Volatile

c) Reserved

d) Large

34. The state of a process is defined by:

a) The final activity of the process

b) The activity just executed by the process

c) The activity to next be executed by the process

d) The current activity of the process

35. What is a trap/exception?

a) Hardware-generated interrupt caused by an error

b) Software-generated interrupt caused by an error

c) User-generated interrupt caused by an error

d) None of these

Questions with Chosen Options (Continued):

36. What is an ISR?

a) Information Service Request

b) Interrupt Service Request

c) Interrupt Service Routine

d) Information Service Routine

37. In the layered approach of Operating Systems:

a) Bottom Layer(0) is the User interface

b) Highest Layer(N) is the User interface

c) Bottom Layer(0) is the hardware

d) Both b and c

38. How does the hardware trigger an interrupt?

a) Sending signals to CPU through system bus

b) Executing a special program called interrupt program

c) Executing a special program called system program

d) Executing a special operation called system call

39. Which operation is performed by an interrupt handler?

a) Saving the current state of the system

b) Loading the interrupt handling code and executing it

c) Once done handling, bringing back the system to the original state it was before the interrupt occurred

d) All of these

40. Which scheduler selects the jobs from the pool of jobs and loads them into the ready queue?

a) Long-term

b) Short-term

c) Medium-term

d) None of the above

41. In the blocked state:

a) The processes waiting for I/O are found

b) The process which is running is found

c) The processes waiting for the processor are found

d) None of the above

42. What is a long-term scheduler?

a) It selects which process has to be brought into the ready queue

b) It selects which process has to be executed next and allocates CPU

c) It selects which process to remove from memory by swapping

d) None of these

43. What is a short-term scheduler?

a) It selects which process has to be brought into the ready queue

b) It selects which process has to be executed next and allocates CPU

c) It selects which process to remove from memory by swapping

d) None of these

44. The distinction between short-term and long-term schedulers is:

a) The length of their queues

b) The type of processes they schedule

c) The frequency of their execution

d) None of these

45. The only state transition initiated by the user process itself is:

a) Block

b) Wake up

c) Dispatch

d) None of these

46. In a time-sharing operating system, when the time slot ends, the process moves to:

a) Blocked state

b) Ready state

c) Suspended state

d) Terminated state

47. If a process is in the blocked state and its I/O service is completed, it moves to:

a) Running state

b) Ready state

c) Suspended state

d) Terminated state

48. Which state transition is not possible?

a) Blocked to running

b) Ready to running

c) Blocked to ready

d) Running to blocked

49. Which module gives control of the CPU to the process selected by the short-term scheduler?

a) Dispatcher

b) Interrupt

c) Scheduler

d) None of the mentioned

50. The processes ready and waiting to execute are kept in:

a) Job queue

b) Ready queue

c) Execution queue

d) Process queue

ANS:

1. Process Control Block
2. Used for monitoring events as they occur
3. Process Control Block
4. Messages
5. All of the mentioned
6. All of the Above
7. System calls
8. Kernel
9. Multiprocessors OS
10. System Call
11. Command interpreter
12. All of the above

13. Interrupt
14. Fork
15. Process Control Block
16. Context Switch
17. Only the process which has control of the processor is found
18. Real-time
19. Communication between two processes
20. Lightweight process
21. Kernel
22. Time Sharing
23. Long-term scheduler (LTS)
24. Program in execution
25. Blocked/Waiting
26. Process Control Block
27. Privileged
28. CPU-bound process
29. Block
30. Real-time
31. I/O-bound process
32. A task must be serviced by its deadline period
33. Volatile
34. The current activity of the process
35. Software-generated interrupt caused by an error
36. Interrupt Service Routine

37. Both b and c

38. Sending signals to CPU through system bus

39. All of these

40. Long-term

41. The processes waiting for I/O are found

42. It selects which process has to be brought into the ready queue

43. It selects which process has to be executed next and allocates CPU

44. The frequency of their execution

45. Block

46. Ready state

47. Ready state

48. Blocked to running

49. Dispatcher

50. Ready queue

Final 2021 Mcq Que:

1. Information about a process is maintained in a:

a) Stack b) Translation Lookaside Buffer

c) Process Control Block d) Program Control Block

2. Real-time systems are:

a) Primarily used on mainframe computers b) Used for monitoring events as they occur c) Used for program development d) Used for real-time interactive users

3. Inter-process communication can be done through:

a) Mails b) Messages

c) System calls d) Traps

4. In Priority Scheduling, a priority number (integer) is associated with each process. The CPU is allocated to the process with the highest priority (smallest integer = highest priority). The problem of starvation of low-priority processes can be resolved by:

a) Terminating the process b) Aging

c) Mutual Exclusion d) Semaphore

5. Which of the following is contained in the Process Control Block (PCB)?

a) Process Number b) List of Open Files

c) Memory Limits d) All of the Above

6. A software that manages the time of a microprocessor to ensure that all time-critical events are processed as efficiently as possible is:

a) Kernel b) Shell

c) Device Driver d) Processor

7. With the round robin CPU scheduling in a time-shared system:

a) Using very large time slices degenerates into a first-come-first-served algorithm

b) Using extremely small time slices improve performance

c) Using extremely small time slices degenerate into last come first served algorithm

d) Using medium-sized time slices leads to shortest request time first algorithm

8. Which of the following is a criterion to evaluate a scheduling algorithm?

a) CPU Utilization: Keep CPU utilization as high as possible.

b) Throughput: Number of processes completed per unit time.

c) Waiting Time: Amount of time spent ready to run but not running.

d) All of the above

9. Super computers typically employ:

a) Real-time Operating system b) Multiprocessors OS

c) Desktop OS d) None of the above

10. What is a shell?

a) It is a hardware component b) It is a command interpreter

c) It is a part in compiler d) It is a tool in CPU scheduling

11. The operating system manages:

a) Memory b) Processor

c) Disk and I/O devices d) All of the above

12. The Hardware mechanism that enables a device to notify the CPU is called:

a) Polling b) Interrupt

c) System Call d) None of the above

13. Process State is a part of:

a) Inode b) Process Control block

c) File Allocation Table d) None of the above

14. Switching the CPU to another Process requires to save state of the old process and loading new process state is called as:

a) Process Blocking b) Context Switch

c) Time Sharing d) None of the above

15. OS pays more attention on the meeting of the time limits:

a) Distributed b) Network

c) Real-time d) Online

16. A process said to be in state if it was waiting for an event that will never occur.

a) Safe b) Unsafe

c) Starvation d) Deadlock

17. A thread is a:

a) Heavy Weight process b) Multiprocess

c) Inter Thread d) Light weight

18. A major problem with priority scheduling is:

a) Definite blocking b) Starvation

c) Low priority d) None of the above

19. The technique, for sharing the time of a computer among several jobs, which switches jobs so rapidly that each job appears to have the computer to itself, is called:

a) Time domain b) Time out

c) Time Sharing d) Multitasking

20. Mutual exclusion:

a) If one process is in a critical region others are excluded

b) Prevents deadlock

c) Requires semaphores to implement

d) Is found only in the Windows NT operating system

21.Which scheduler controls the degree of multiprogramming?

a) Short-term scheduler b) Long-term scheduler

c) Middle-term scheduler d) None of the above

22.The state of a process after it encounters an I/O instruction is:

a) Ready b) Blocked/Waiting

c) Idle d) Running

23.In one of the deadlock prevention methods, impose a total ordering of all resource types, and require that each process requests resources in an increasing order of enumeration. This violates the condition of deadlock:

a) Mutual exclusion b) Hold and Wait

c) Circular Wait d) No Preemption

24.A scheduling algorithm is fair:

a) If no process faces starvation

b) If a process is starved, detect it and run it with high priority

c) If it uses semaphores

d) Only if a queue is used for scheduling

25.Round robin scheduling is essentially the preemptive version of:

a) FIFO b) Shortest job first

c) Shortest remaining time d) Longest time first

26.Maximize throughput, minimize response time, and accommodate as many users as possible is considered as:

a) Fairness b) Efficiency

c) Differential responsiveness d) All of the above

27.Which is not the state of the process?

a) Blocked b) Running

c) Ready d) Privileged

28.Which technique was introduced because a single job could not keep both the CPU and the I/O devices busy?

a) Time-sharing b) SPOOLing

c) Preemptive scheduling d) Multiprogramming

29.FIFO scheduling is:

a) Preemptive Scheduling b) Non-Preemptive Scheduling

c) Deadline Scheduling d) Fair share scheduling

30.The state of a process during an I/O instruction is:

a) Ready b) Blocked/Waiting

c) Idle d) Running

Answers:

1. c
2. b
3. b
4. b
5. d
6. a
7. a

8. d
9. b
10. b
11. d
12. b
13. b
14. b
15. c
16. d
17. d
18. b
19. c
20. a
21. b
22. b
23. c
24. a
25. a
26. b
27. d
28. d
29. b
30. b

Question Two

Find the average waiting time for the following set of processes given their arrival time in the order:

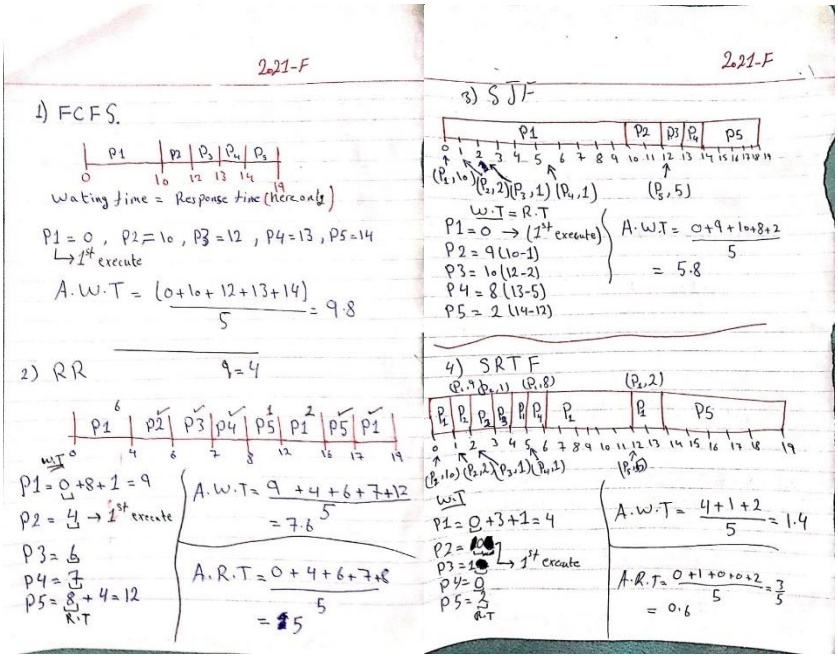
Process	Burst Time	Arrival Time
P1	10	0
P2	2	1
P3	1	2
P4	1	5

Process	Burst Time	Arrival Time
P5	5	12

Using each of the following algorithms:

a) First Come First Served (FCFS) algorithm.
b) Round Robin (RR) scheduling algorithm with a quantum time slice of 4.
c) Shortest Job First (SJF) scheduling algorithm.
d) Shortest Remaining Time First (SRTF) algorithm.

Solution:



Mcq:

1. First Come First Served (FCFS) Algorithm

1.1 What is the average waiting time for the processes?

a) 6.2 b) 8.4

c) 9.8 d) 11.0

2. Round Robin (RR) Scheduling Algorithm with Quantum Time Slice of 4

2.1 Which process completes its execution first?

a) P1 b) P2

c) P3 d) P4

2.2 What is the average waiting time for the processes?

a) 5.2 b) 7.6

c) 8.8 d) 10.2

3. Shortest Job First (SJF) Scheduling Algorithm

3.1 Which process is scheduled first?

a) P1 b) P2

c) P3 d) P4

3.2 What is the average waiting time for the processes?

a) 5.8 b) 7.6

c) 8.8 d) 10.2

4. Shortest Remaining Time First (SRTF) Algorithm

4.1 Which process has the shortest remaining time after the first scheduling?

a) P1 b) P2

c) P3 d) P4

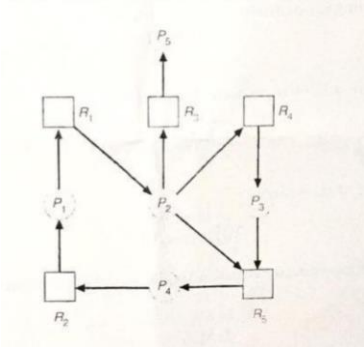
4.2 What is the average response time for the processes?

a) 3.4 b) 4.2

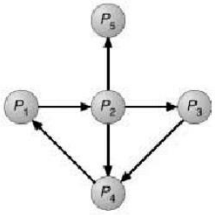
c) 0.6 d) 6.3

Question Three

1. Convert the following Resource-Allocation Graph to a Wait-for Graph.



Solution:



Mcq:

Which of the following represents the correct Wait-for Graph (WFG)?

A.

- P1→P4
- P4→P3
- P3→P2

- P2→P1

B.

- P1→P2
- P2→P4
- P4→P3
- P3→P1

C.

- P1→P3
- P3→P2
- P2→P4
- P4→P1

D.

- P1→P4
- P4→P2
- P2→P3
- P3→P1

Page Reference String Analysis:

<1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5>

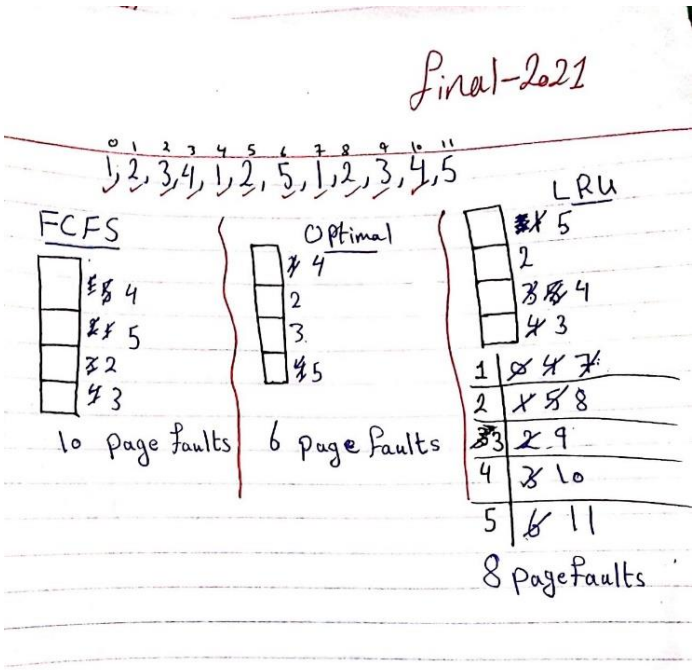
How many page faults would occur for the following replacement algorithms, assuming four frames (initially empty)?

a) FCFS replacement

b) Optimal replacement

c) Least Recently Used (LRU) replacement

Solution:



Mcq:

5. Resource-Allocation Graph to Wait-for Graph Conversion

5.1 Which of the following correctly represents a Wait-for Graph?

a) Process A → Process B

b) Process B → Process C

c) Process C → Process D

d) Process D → Process A

6. Page Reference String Analysis

6.1 How many page faults would occur using the FCFS replacement algorithm?

a) 6 b) 8

c) 10 d) 12

6.2 How many page faults would occur using the Optimal replacement algorithm?

a) 4 b) 5

c) 6 d) 7

6.3 How many page faults would occur using the Least Recently Used (LRU) replacement algorithm?

a) 6 b) 7

c) 8 d) 9

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Question 1: Choose the correct answer (30 marks, 1 mark for each)

1. Turnaround time is the amount of time to execute a particular process while waiting time is the amount of time a process has been waiting in the ready queue.
2. The Paging approach resolved the external fragmentation problem while internal fragmentation is resolved by segmentation.
3. In Parallel systems, a job should be split into small dependent jobs.
4. In memory allocations, Best-fit and Worst-fit are better than First-fit in terms of speed and storage utilization.
5. Hold-and-wait condition is to allow one or more processes to hold I/O device(s) and wait for another I/O device(s).
6. MULTICS solved the problems of external fragmentation and lengthy search times by paging the segments.
7. Executing an illegal instruction is considered as an interrupt.
8. Time-sharing systems are suitable for Mainframes.
9. In the asynchronous I/O structure, control is only returned after I/O is complete.
10. Collecting statistics and monitoring performance are essential parts of any operating system.
11. System calls provide the interface between a running program and the operating system.
12. The interrupt service routine contains the addresses of the interrupt vectors.

13. In Simple batch systems, the transition between jobs should be as smooth as possible.
14. Module Kernel is responsible for memory management.
15. To keep track of the segment table, we use a Limit register that holds the smallest legal physical memory address while the base register contains the size of the range.
16. A child process may not be destroyed when its parent process is destroyed.
17. In a multiple-threaded task, while one thread is blocked and waiting, a second thread in the same task can proceed.
18. Preemptive is useful in systems in which high-priority processes require rapid attention.

1. Ans: True: Turnaround time includes execution and waiting, while waiting time is only the time spent waiting in the ready queue.
2. False: The Paging approach resolved the external fragmentation problem, but internal fragmentation is resolved by paging itself, not segmentation.
3. True: In parallel systems, a job should be split into smaller dependent tasks that can run concurrently.
4. False: In memory allocation, Best-fit and Worst-fit are often slower than First-fit due to more complex searching methods, even though they can improve storage utilization.
5. True: Hold-and-wait condition allows one or more processes to hold I/O devices and wait for another device.
6. False: MULTICS did not solve problems by paging the segments; it used segmentation along with paging to address fragmentation and other issues.
7. True: Executing an illegal instruction generates an interrupt (exception) that requires the operating system's intervention.
8. False: Time-sharing systems are not specifically designed for mainframes, although they can be used on mainframes. They are more suited for systems with multiple users.
9. False: In asynchronous I/O, control returns immediately to the program while the I/O operation is being performed in the background.
10. True: Collecting statistics and monitoring performance are vital parts of any operating system for optimization and fault detection.
11. True: System calls provide an interface between running programs and the operating system for resource access.
12. False: Interrupt service routines do not contain addresses of the interrupt vectors. The interrupt vector table holds those addresses.

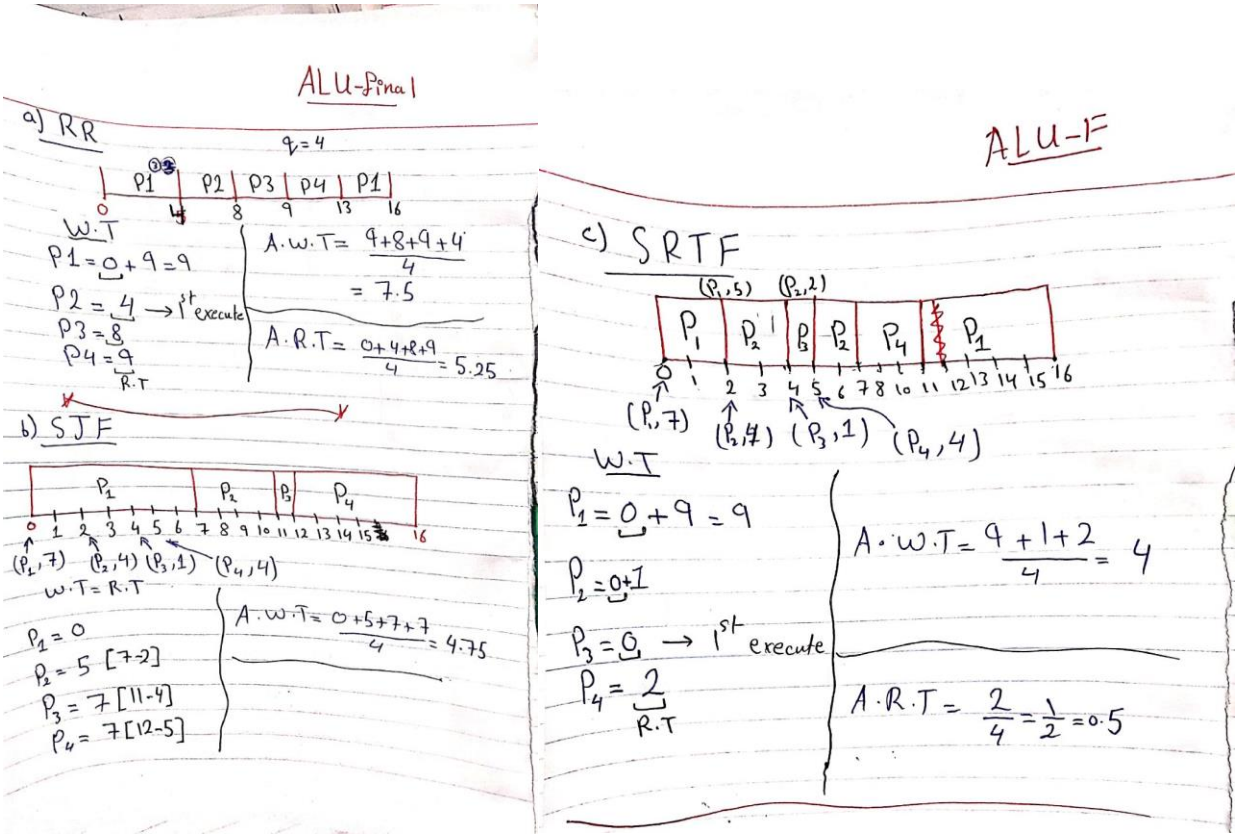
13. True: In simple batch systems, transitions between jobs should be smooth to ensure efficient use of resources.
14. False: The kernel is responsible for many functions, but memory management specifically is handled by the memory manager.
15. False: The base register holds the starting address of a segment, and the limit register holds its size. The description in the statement is reversed.
16. True: A child process may continue executing even if its parent process is destroyed, though it may become orphaned.
17. True: In a multi-threaded environment, while one thread is blocked, other threads can continue execution.
18. True: Preemptive scheduling is effective for giving high-priority processes rapid attention in a system.

Process	Burst Time	Arrival Time
P1	7	0.0
P2	4	2.0
P3	1	4.0
P4	4	5.0

Using each of the following algorithms:

a) Round Robin scheduling algorithm with quantum time slice = 4. (2 points)
b) Shortest Job First Scheduling algorithm. (2 points)
c) Shortest Remaining Time First algorithm. (2 points)

Solution:



1. Round Robin Scheduling Algorithm with Quantum Time Slice = 4

1.1 Which process completes its execution first?

a) P1 b) P2

c) P3 d) P4

1.2 What is the average waiting time for the processes?

a) 2.75 b) 7.5

c) 4.5 d) 5.25

2. Shortest Job First Scheduling Algorithm

2.1 Which process is scheduled first?

a) P1 b) P2

c) P3 d) P4

2.2 What is the average waiting time for the processes?

a) 5.75 b) 6.25

c) 7.0 d) 4.75

3. Shortest Remaining Time First Algorithm

3.1 Which process has the shortest remaining time after the first scheduling?

a) P1 b) P2

c) P3 d) P4

3.2 What is the average response time for the processes?

a) 1.25 b) 2.0

c) 3.25 d) 4.0

Best Wishes