Topic 1: Basics & System Structure

Q1. Which of the following is NOT considered hardware?

- A) Processor
- B) Keyboard
- C) Magnetic Disk
- D) Device Driver

Answer: D) Device DriverExplanation: A device driver is a system program (software), whereas the others are physical components 1.

Q2. The Kernel Mode of an Operating System is also referred to as:

- A) Privileged Mode
- B) System Mode
- C) Supervisor Mode
- D) All of the above

Answer: D) All of the aboveExplanation: The kernel runs with full access to hardware and is distinct from User Mode (where the mode bit is 1) 2, 3.

Q3. During the machine boot process, the check for peripheral connectivity is called:

- A) BIOS
- B) POST
- C) MBR
- D) Loader

Answer: B) POST (Power On Self-Test)Explanation: This test checks if connected hardware (peripherals) is functioning correctly before loading the OS 4.

Q4. Which of the following is an Open Source Operating System?

- A) Windows
- B) iOS
- C) Linux
- D) Oracle

Answer: C) LinuxExplanation: Linux is distributed under an open-source license 5, 6.

Topic 2: Process Management

Q5. Which System Call is used to create a new process?

- A) create()
- B) new()
- C) fork()
- D) start()

Answer: C) fork()Explanation: The fork() system call is used to create a child process. A process with n fork() calls creates $2^n - 1$ child processes 2, 7.

Q6. A process that is in the Main Memory and waiting for CPU time is considered to be in which state?

- A) New State
- B) Ready State
- C) Waiting State
- D) Running State

Answer: B) Ready StateExplanation: The "Waiting" state usually refers to waiting for I/O operations. Waiting for the CPU happens in the Ready queue 8, 9.

Q7. Which component copies the process context and restores it into the CPU (moves process from Ready to Running)?

- A) Scheduler
- B) Dispatcher
- C) Linker
- D) Loader

Answer: B) DispatcherExplanation: The Scheduler selects the process, but the Dispatcher is the module that actually gives control of the CPU to that process 8, 10.

Q8. Which system call never fails?

- A) open()
- B) fork()
- C) getpid()
- D) read()

Answer: C) getpid()Explanation: Every process has a unique Process ID (PID), so requesting it will always return a value 11.

Topic 3: CPU Scheduling

Q9. Which CPU scheduling algorithm leads to Starvation?

- A) First-Come, First-Served (FCFS)
- B) Round Robin
- C) Shortest Job First (SJF)
- D) None of the above

Answer: C) Shortest Job First (SJF)Explanation: If shorter processes keep arriving, a long process may never get the CPU, leading to starvation 10, 12.

Q10. The Convoy Effect occurs in which scheduling algorithm?

- A) Round Robin
- B) FCFS
- C) SJF
- D) Priority

Answer: B) First-Come, First-Served (FCFS)Explanation: A long CPU-bound process can block many I/O-bound processes behind it, slowing down the system 13, 14.

Q11. Which CPU scheduling algorithm ensures Minimum Average Waiting Time?

- A) FCFS
- B) Round Robin
- C) Shortest Job First (SJF)
- D) Priority Scheduling

Answer: C) Shortest Job First (SJF)Explanation: Mathematically, SJF gives the minimum average waiting time for a given set of processes 11, 15.

Q12. Which scheduling algorithm is Non-Preemptive?

- A) FCFS
- B) SJF (Non-preemptive version)
- C) Priority (Non-preemptive version)
- D) All of the above

Answer: D) All of the aboveExplanation: Round Robin is always preemptive. The others listed have non-preemptive modes 13.

Topic 4: Memory Management

Q13. The Memory Management Unit (MMU) is a:

- A) System Program
- B) Application Program
- C) Hardware Component
- D) Firmware

Answer: C) Hardware ComponentExplanation: The MMU is a hardware device that maps logical addresses to physical addresses at run time 14, 16.

Q14. Which memory allocation method is considered the Fastest?

- A) Best Fit
- B) Worst Fit
- C) First Fit
- D) Next Fit

Answer: C) First FitExplanation: First Fit is generally faster because it stops searching as soon as it finds a hole large enough, unlike Best Fit which searches the entire list 17, 18.

Q15. In which memory scheme is there NO External Fragmentation?

- A) Segmentation
- B) Paging
- C) Swapping
- D) Contiguous Allocation

Answer: B) PagingExplanation: Paging divides memory into fixed-size frames, eliminating external fragmentation (though internal fragmentation may still exist) 17, 19.

Q16. Which Page Replacement Algorithm suffers from Belady's Anomaly?

- A) LRU (Least Recently Used)
- B) Optimal
- C) FIFO (First-In, First-Out)
- D) Stack-based algorithms

Answer: C) FIFOExplanation: Belady's Anomaly is a phenomenon where increasing the number of page frames results in *more* page faults, which is unique to FIFO 20, 21.

Topic 5: Deadlocks

Q17. Which of the following is a necessary condition for a Deadlock?

- A) Mutual Exclusion
- B) Hold and Wait
- C) Circular Wait
- D) All of the above

Answer: D) All of the aboveExplanation: The four necessary conditions are Mutual Exclusion, Hold and Wait, No Preemption, and Circular Wait 14, 22.

Q18. To recover from a deadlock, a process that is terminated is referred to as:

- A) A Zombie
- B) A Victim
- C) An Orphan
- D) A Child

Answer: B) A VictimExplanation: When resolving a deadlock by termination, the OS selects a "victim" process to kill to free up resources 23, 24.

Q19. Which algorithm is used for Deadlock Avoidance?

- A) Round Robin
- B) Banker's Algorithm
- C) Elevator Algorithm
- D) Karn's Algorithm

Answer: B) Banker's AlgorithmExplanation: The Banker's algorithm checks if allocating resources will leave the system in a safe state 25, 26.

Topic 6: File Systems & Advanced Concepts

Q20. What is the file format of an Executable File in Windows?

- A) ELF
- B) PE (Portable Executable)
- C) COFF
- D) OUT

Answer: B) PE (Portable Executable)Explanation: Windows uses the PE format, while Linux typically uses ELF 27.

Q21. Which section of an executable file contains the "Magic Number"?

- A) Data Section
- B) Code Section
- C) Primary Header
- D) BSS

Answer: C) Primary HeaderExplanation: The magic number (used to identify file types) is located in the header 5.

Q22. Information about a file is kept in a structure called:

- A) PCB (Process Control Block)
- B) FCB (File Control Block)
- C) DCT
- D) UFD

Answer: B) FCB (File Control Block)Explanation: The FCB contains details like file permissions, size, and location 20.

Q23. Which of the following is NOT a Windows File System?

- A) NTFS
- B) FAT32
- C) exFAT
- D) HFS

Answer: D) HFSExplanation: HFS (Hierarchical File System) is used by macOS, not Windows 28.

This is the **Master List of Operating System PYQs** (Previous Year Questions) collected from the 2019–2024 exam cycles.

Since you have the exam day after tomorrow, **do not just read these—solve them mentally right now.** These specific questions repeat with only slight number changes.

Topic 1: Process Management (High Importance)

Most repeated question type: The fork() system call.

Q1 (2022, 2019 PYQ):

Consider the following code snippet. How many times is "Hello" printed?

```
C
fork();
fork();
fork();
printf("Hello\n");
```

- **Options:** A) 3 B) 7 C) 8 D) 16
- **Answer: C) 8**
- **Logic:** The formula is 2^n where n is the number of fork calls. $2^3 = 8$.

Q2 (2021 PYQ):

How many new child processes are created by the following code?

```
C
fork();
fork();
fork();
```

- **Options:** A) 8 B) 7 C) 3 D) 4
- **Answer: B) 7**
- **Logic:** Total processes = 2^n. Total **child** processes = $2^n - 1$. So, $8 - 1 = 7$.

Q3 (2023 PYQ - Tricky):

If a parent process P creates a child process C, which of the following do they NOT share?

- **Options:** A) Code Segment B) Data Segment C) Stack D) Heap
- **Answer: C) Stack**
- **Logic:** Processes share code (text) but have separate Stacks, Heaps, and Data segments. (Note: **Threads** share Heap and Data, but not Stack).

Topic 2: CPU Scheduling (Numericals)

Focus on Average Waiting Time (AWT).

Q4 (2020, 2024 PYQ):

Consider 3 processes arriving at time 0 with burst times: P1=24, P2=3, P3=3. What is the Average Waiting Time (AWT) using FCFS?

- **Calculation:**
  - Order: P1(0-24), P2(24-27), P3(27-30).

    - Waiting Times: P1=0, P2=24, P3=27.
    - Average: $(0+24+27)/3 = 51/3 = 17$.
- **Answer: 17 ms**

Q5 (Theoretical One-Liner):

Which scheduling algorithm minimizes the average waiting time for a given set of processes?

- **Options:** A) FCFS B) Round Robin C) SJF D) Priority
- **Answer: C) SJF (Shortest Job First)** (This is theoretically optimal).

Q6 (2018 PYQ):

Which problem is associated with Priority Scheduling?

- **Answer: Starvation** (Low priority processes may never execute).
- **Solution: Aging** (Gradually increasing priority of old processes).

Topic 3: Memory Management (Maths)

Q7 (2022 PYQ):

If the page size is 4KB (2^{12}) and the logical address is 32-bits, what is the size of the Page Table (number of entries)?

- **Logic:**
    - Number of Pages = $\frac{\text{Logical Address Space}}{\text{Page Size}}$
    - Pages = $2^{32} / 2^{12} = 2^{20}$
- **Answer: 1 Million entries (2^{20})**

Q8 (Concept Check):

When does a Page Fault occur?

- **Answer:** When the requested page is not present in the **Main Memory (RAM)**.

Q9 (Thrashing):

What is "Thrashing" in an OS?

- **Answer:** When the CPU spends more time **swapping pages** (paging in/out) than actually executing instructions. (Caused by too few frames allocated to a process).

Topic 4: Deadlock & Linux Commands

Q10 (Guaranteed Question):

Which of the following is NOT a necessary condition for Deadlock?

- **Options:** A) Mutual Exclusion B) Hold & Wait C) Circular Wait D) Preemption
- **Answer: D) Preemption** (The actual condition is **No Preemption**).

Q11 (Banker's Algorithm):

The Banker's Algorithm is used for:

- **Answer: Deadlock Avoidance**.

Q12 (Linux PYQ 2023):

What is the output of the command chmod 764 myfile?

- **Logic:**
    - 7 (Owner) = R+W+X
    - 6 (Group) = R+W
    - 4 (Others) = R
- **Answer:** Owner: Read/Write/Exec; Group: Read/Write; Others: Read only.

Q13 (Linux PYQ 2021):

Which command is used to count the number of lines, words, and characters in a file?

- **Answer: wc** (Word Count).

Practice Tips for C-CAT OS Section

- **Focus on "Starvation":** Remember that **SJF** and **Priority Scheduling** cause starvation, while **Round Robin** and **FCFS** generally do not 10.
- **Hardware vs. Software:** Questions often ask if components like the **MMU** or **Drivers** are hardware or software. (MMU = Hardware; Driver = Software) 1, 14.
- **Process vs. Thread:** A process is an execution instance (heavyweight), while a thread is a lightweight unit of execution within a process 29, 30.
- **Important Acronyms:**
- **PCB:** Process Control Block.
- **FCB:** File Control Block.
- **IPC:** Inter-Process Communication (Mechanisms: Pipe, Socket, Semaphore) 31, 32.