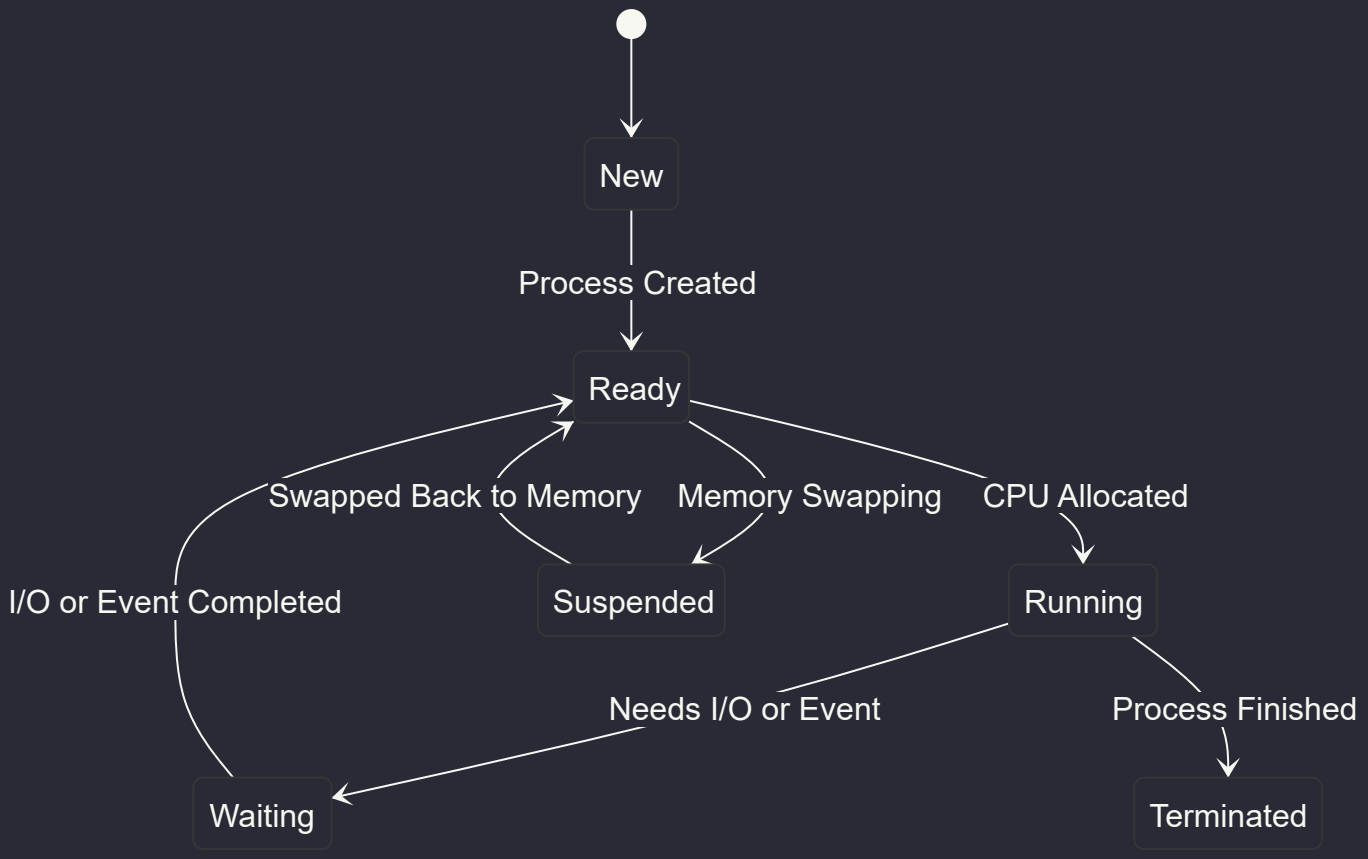
OSY-PT-2-SOLUTION-SET-1

Q1. Attempt Any FOUR

1. Draw a neat labelled diagram for process state



---

2. Define: Interprocess Communication along with Shared Memory

- **Interprocess Communication (IPC)**: IPC is a mechanism that allows processes to communicate and synchronize with each other. This is essential for data exchange between processes, allowing them to work together without interference.
- **Shared Memory**: Shared memory is an IPC method where multiple processes can access a common memory space. This memory is allocated by the operating system and is used for exchanging data, allowing fast and efficient communication without the need for messages or signals.

---

3. List any four file attributes and their meaning

Attribute	Meaning
File Name	The name assigned to the file, allowing users to identify it.
File Type	Identifies the file format (e.g., text, binary, executable).
Size	Indicates the file's size in bytes, which is useful for memory and storage management.
Permissions	Defines who can read, write, or execute the file, securing it from unauthorized access.

---

4. Define: CPU Utilization and Throughput

- **CPU Utilization**: Refers to the percentage of time the CPU is actively processing instructions. Higher CPU utilization indicates that the CPU is efficiently utilized.
- **Throughput**: Measures the number of processes completed in a given time. Higher throughput indicates a system's ability to handle multiple tasks efficiently.

---

5. Explain: Multilevel Queue Scheduling

- **Multilevel Queue Scheduling** is a process scheduling method where processes are classified into multiple queues based on priority or other criteria (e.g., foreground and background). Each queue has a different scheduling policy, such as Round Robin or First-Come, First-Serve. The system assigns each process to a queue and then schedules them according to their queue's policy.

---

6. Define: Thread and its Types

- **Thread**: A thread is the smallest unit of a process that can be scheduled and executed. Threads allow multiple tasks to run concurrently within a single process.
- **Types of Threads**:
  - **User Threads**: Managed by user-level libraries without kernel support.
  - **Kernel Threads**: Managed by the operating system kernel, enabling better process management.
  - **Single-threading**: Executes one thread at a time.
  - **Multi-threading**: Executes multiple threads simultaneously within a process.

Q2. Attempt Any THREE

1. Explain Round Robin algorithm with a suitable example

- **Round Robin Algorithm**: This is a preemptive CPU scheduling algorithm where each process is given a fixed time slice (quantum) for execution. If a process doesn't finish within its quantum, it goes to the end of the queue, and the CPU moves to the next process. This cycle continues until all processes complete.

Example:
Consider 3 processes with the following burst times and a quantum of 4:

Process	Burst Time
P1	6
P2	8
P3	7

- **Execution Order**:
  - P1 executes for 4, remaining burst = 2.
  - P2 executes for 4, remaining burst = 4.
  - P3 executes for 4, remaining burst = 3.
  - Continue in this order until all burst times are zero.

---

2. Enlist different file allocation methods? Explain contiguous allocation method in detail

- **File Allocation Methods**:
  1. **Contiguous Allocation**: Files are stored in consecutive blocks on the disk.
  2. **Linked Allocation**: Files are stored in blocks linked together using pointers.
  3. **Indexed Allocation**: An index block holds pointers to the blocks of the file.
- **Contiguous Allocation**:
  - **Explanation**: In contiguous allocation, each file occupies a set of contiguous blocks on the disk. This allocation method is straightforward, fast for sequential access, and minimizes seek time.
  - **Merits**: Simple and efficient for large sequential files.
  - **Demerits**: Can lead to fragmentation as files grow or shrink.

---

3. Explain PCB with Diagram

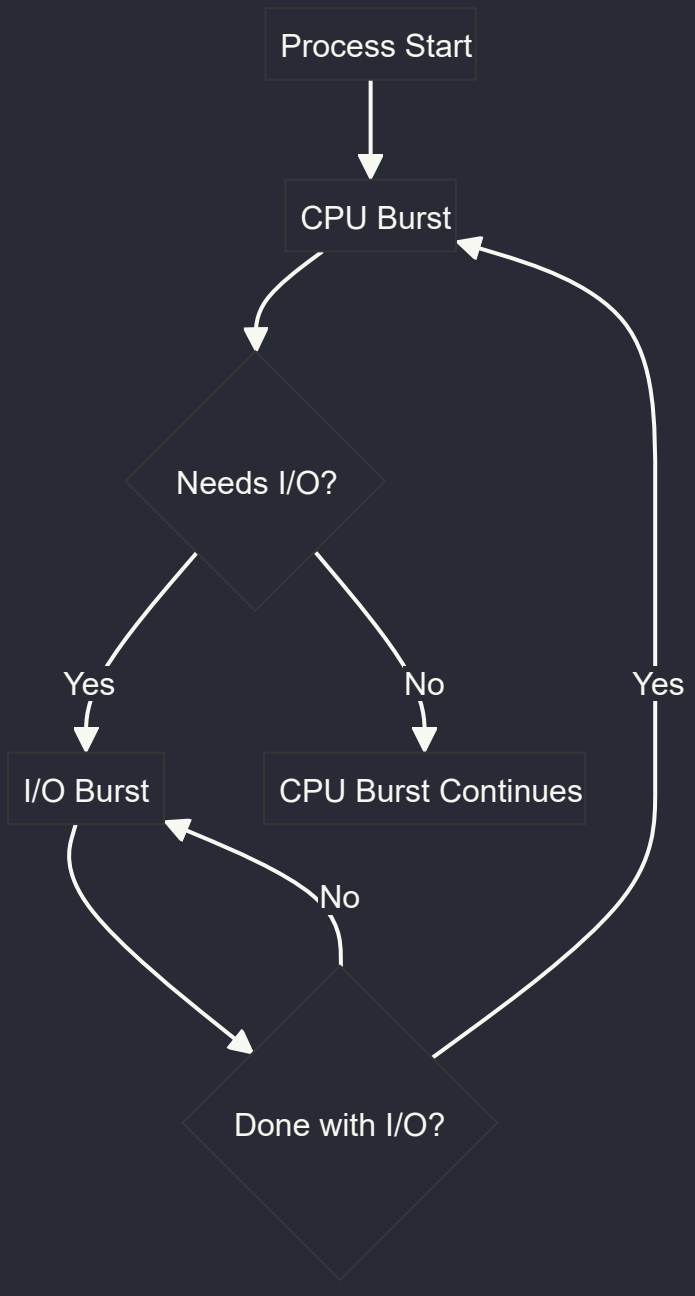
- **Process Control Block (PCB)**: The PCB is a data structure maintained by the operating system for each process. It stores essential information about a process, such as its state, program counter, CPU registers, memory limits, and more.

PCB Field	Description
Process ID	Unique identifier for each process
Process State	Indicates if the process is running, waiting, or blocked
Program Counter	Stores the address of the next instruction
CPU Registers	Stores process-specific CPU register values
Memory Limits	Tracks memory allocation and boundaries
Open Files	List of files opened by the process

---

4. Describe I/O burst and CPU burst cycle with a neat diagram

- **I/O Burst**: The time a process spends on I/O operations.
- **CPU Burst**: The time a process spends executing on the CPU.



5. Solve Process Scheduling Problem using SJF and FCFS, and calculate average waiting time

Given Processes:

Process	AT (Arrival Time)	BT (Burst Time)
P1	0	7
P2	1	4
P3	2	10
P4	3	6
P5	4	8

(i) Shortest Job First (SJF):

Process	AT (from AT col)	BT (from BT col)	CT (Completion Time)	WT (Waiting Time)
P1	0	7	7 = AT(0) + BT(7)	0 = CT(7) - BT(7)
P2	1	4	11 = CT(7) + BT(4) from prev	6 = CT(11) - AT(1)
P4	3	6	17 = CT(11) + BT(6)	10 = CT(17) - AT(3)
P5	4	8	25 = CT(17) + BT(8)	12 = CT(25) - AT(4)
P3	2	10	35 = CT(25) + BT(10)	19 = CT(35) - AT(2)

- **Order**: **P1 -> P2 -> P4 -> P5 -> P3**

$$\text{Average Waiting Time (SJF)} = \frac{0 + 6 + 10 + 12 + 19}{5} = 9.4 \text{ units}$$

(ii) First-Come, First-Serve (FCFS):

Process	AT (from AT col)	BT (from BT col)	CT (Completion Time)	WT (Waiting Time)
P1	0	7	7 = AT(0) + BT(7)	0 = CT(7) - BT(7)

Process	AT (from AT col)	BT (from BT col)	CT (Completion Time)	WT (Waiting Time)
P2	1	4	11 = CT(7) + BT(4) from prev	7 = CT(11) - AT(1)
P3	2	10	21 = CT(11) + BT(10)	9 = CT(21) - AT(2)
P4	3	6	27 = CT(21) + BT(6)	18 = CT(27) - AT(3)
P5	4	8	35 = CT(27) + BT(8)	23 = CT(35) - AT(4)

- **Order**: **P1 -> P2 -> P3 -> P4 -> P5**

$$\text{Average Waiting Time (FCFS)} = \frac{0 + 7 + 9 + 18 + 23}{5} = 11.4 \text{ units}$$
