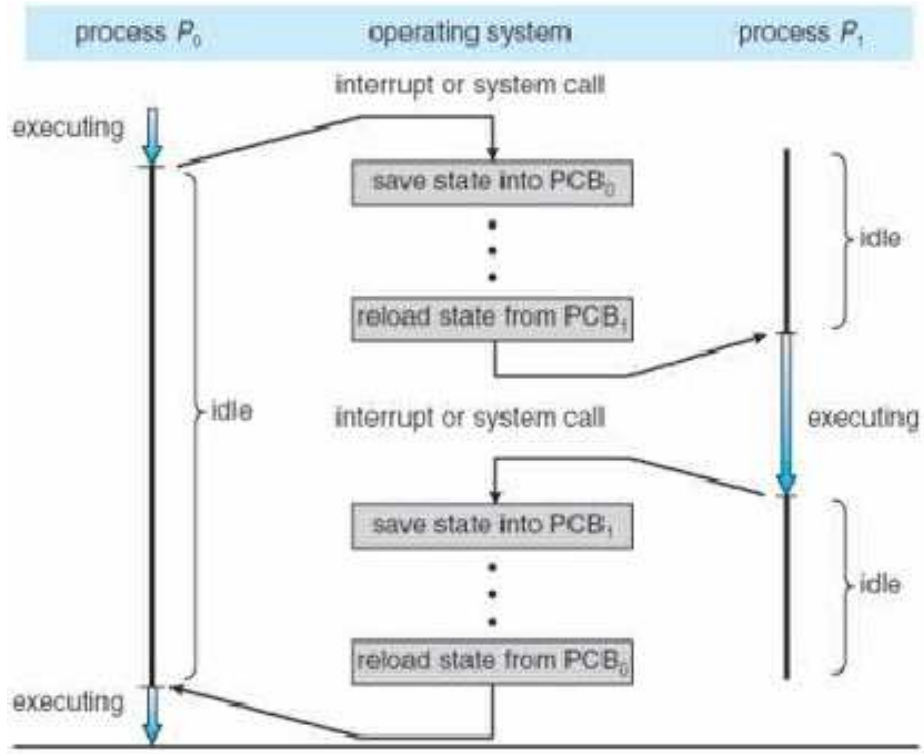
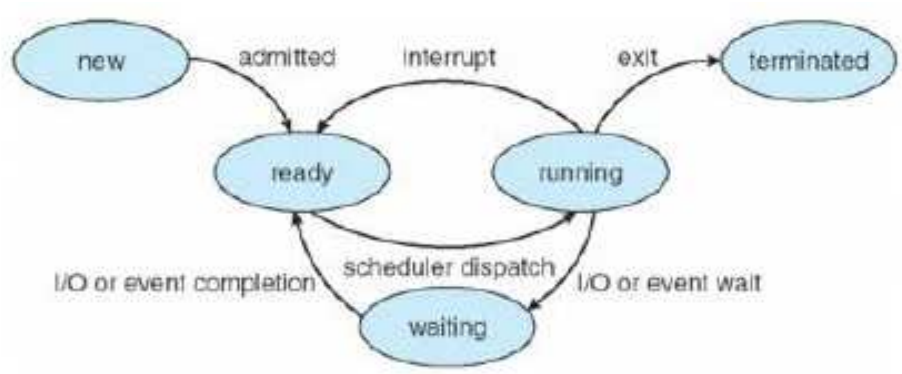
1. What is interrupt
   An interrupt is a signal to the processor emitted by the hardware or software indicating an event needs immediate attention.

2. How does software trigger an interrupt?
   Software triggers an interrupt by executing a special operation called **system call**.

3. With the aid of a neat diagram, explain the role of an interrupt in a context switch.



4. A **process** is a program in execution. With an aid of a neat diagram show the time relation between each of the 5 states a process can be in.

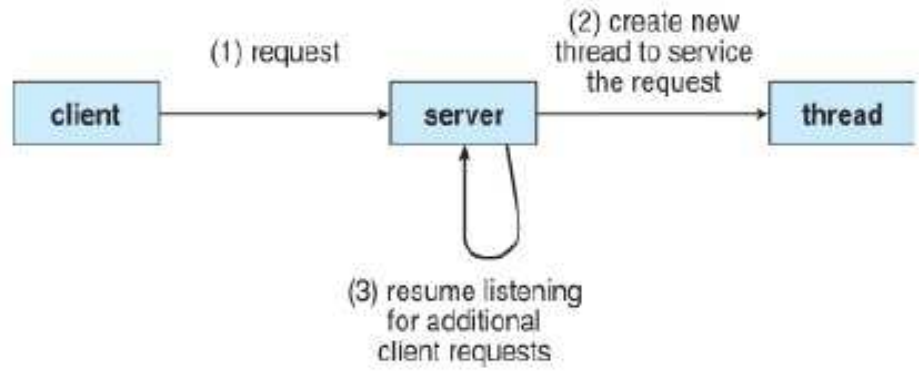


5. Explain the function of the Process Control Block (PCB).
   The function of the PCB is for storing the collection of information about the processes. PBC is a data structure in the operating system Kernel containing the information needed to manage a particular process.

6. Operating System theory distinguishes between threads and process. Explain the difference between threads and processes.
    - Threads are used for lightweight task whereas processes are used for more heavyweight tasks.
    - Threads within the same process share the same address space, whereas different processes do not.

7. Discuss the three benefits of multithreaded programming.
    - Multithreading enables multitasking within a process
    - Threads share the memory and the resources of the process to which they belong
    - Multiple threads can run in parallel on different processor.

8. With the aid of a diagram, explain how a web server might use thread to advantage.



Every request to the server can be met with a separate thread.

9. Race Condition
   Race condition occurs when two or more threads can access shared data and try to change it at the same time.

10. Explain the function of the software algorithm known as the Peterson Solution
    Peterson's Algorithm uses a two process approach to solve the CS problem.
    The load and store processes. Two variables share two processes:
    int turn;
    Boolean flag [2];
    - The variable **turn** indicates whose turn it is to enter the critical section (CS).
    - The **flag** array is used to indicate if a process is ready to enter the critical section.

      i.e. **flag[i] = true** implies the process P_i is ready.

11. What is the readers and writers' problem and how is it overcome?
    The readers and writers' problem is that;

- Multiple readers are allowed to access/read the data set.
- Only one single writer is allowed to access/write at the same time.

This problem is solved by kernel providing read-write locks. Once the reader enters the entry section, it locks the resource. Preventing from writers. Subsequent reader will access the locked resource. The last reader will unlock the resource to available for writers.

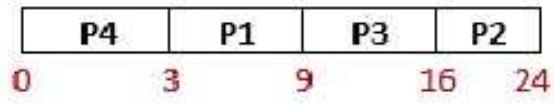
12. Explain the problem that can arise in the Dining Philosophers Problem when there is no process synchronization?
Five philosopher sitting at a round dining table to eat. Each philosopher has got a plate and one chopstick at the right side of each plate. In order to start eating, each of them need a plate and two chopsticks. Thus, clearly there will be a deadlock and starvation because of the limited number of chopsticks.

13. Define the six (5) scheduling criteria to measure best performance.
    - **CPU Utilization** – keep the CPU as busy as possible.
    - **Throughput** – number of processes completed their execution per time unit.
    - **Turnaround time** – amount of time to execute a particular process.
    - **Waiting time** – amount of time a process waits in the ready queue.
    - **Response time** – amount of time it takes from when a request was submitted until the first response is produced.

14. Show an SJF scheduling chart using the following burst time.

PROCESS	BURST TIME
P1	6
P2	8
P3	7
P4	3

a) The Shortest Job First (SJF) scheduling chart



b) Calculate the average waiting time for the SJF data in part (a).

$$\frac{(3+16+9+0)}{4}=\frac{28}{4}=7\ Milliseconds$$

c) What is the purpose of deterministic modeling?
Takes a particular predetermined workload and defines the performance of each algorithm for that workload.