Q7. Explain deadlock in detail and its characteristics. (5 marks)
ANS:-

It happens when two or more processes require some resource to complete their execution that is held by the other process.

- mutual exclusion- a resource that is held by one process at a time.
- hold and wait- a process that holds many resources and even requests more resources from other processes. which are holding them.
- No preemption- process which can only release resources voluntarily.
- circular wait- process gets token to execute the resources for some time then releases the token.

Q5. Explain Virtual memory and swap memory (5 marks)
ANS:-

Swap memory-

- It can easily hold those inactive blocks of RAM that are hardly used once or twice and then they are never used. The freed-up RAM can then be used to hold more programs that have a higher priority.
- It prevents RAM from running out of space.
- It acts as a backup for enhancing the actual space of RAM.
- It allows you to run heavy applications more conveniently that require a large amount of RAM.
- During the process of hibernation, all the contents of RAM are written on the swap memory. Therefore, it is essentially required for the hibernation process to take place successfully.
- It enhances the overall performance of your system.

Virtual Memory-

It is the extra memory that is the part of the hard disk. The advantage of this virtual memory is if any program is not able to run in the main memory then this is used as the extended memory.

- All the memory is are translated into physical addresses on the runtime.
- when any process is running it doesn’t need the whole memory to process it breaks down and free up the spaces.

When RAM runs low, virtual memory can move data from it to a space called a paging file. It allows for RAM to be freed up so that a computer can complete the task.

Q1. List out different OOPS principles and explain with examples? (10 marks)

ANS:-

- Polymorphism
- Encapsulation
- Inheritance
- Abstraction

Polymorphism:

It means a function that has the same name but can be used for different purposes.

Ex- len() function is a function that can be used for measuring length for string or list or dictionary or set of tuples.
The len() function is python inbuild function.
eg., lists = [1,2,3,4,5,65,7]
length = len(lists) //7

Encapsulation:

It is of 3 types:

- protected
- private

Protected:

The variables are wrapped in the class and cannot be accessed outside class but they can be accessed inside the class. It can be used by using
underscore “_”.

```
Ex- class Node:
    def __init__(self):
        self._a = 2

    class Occured(Node):
        def __init__(self):
            print(" protected member of node class:
        ")
            print(self._a)
            obj1 = Occured()
            obj2 = Node()
```

private:

The variables are wrapped in the class same as protected and they cannot be used outside the class. It can be used by using double underscore “__”.

Ex:

```
class Node:
    def __init__(self):
        self._a = 2
class Derived(Base):
    def __init__(self):

        Base.__init__(self)
        print(" private member of base class: ")
        print(self.__c)
obj1 = Node()
print(obj1.a)
```

Inheritance:

It means passing down the values from parent to child. The values can be used in the child of the parents.

Abstraction:

It means any idea which is not associated with any instance.

Q2. List out Layers of the OSI Model and explain? (10 marks)

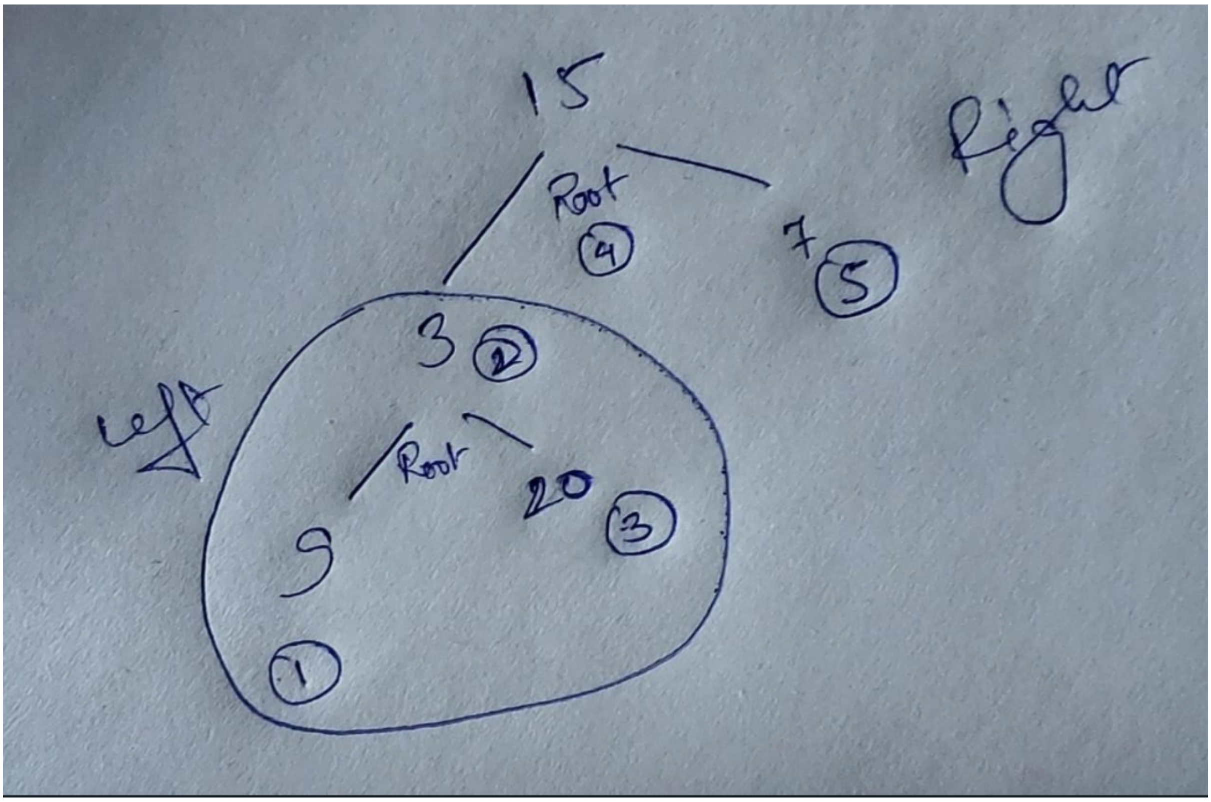
ANS:-

- physical layer- It is basically wire which is used for making communication network.
- Datalink layer- it is the layer where the data is transferred in packets it contains data and header and others more. The data are broken down and sent through packets with numbers from the source and get assembled in the destination.
- network layer - its work basically is to find the address to send the packets to the destination address using the ip address.
- transport layer - its work is to check the errors of the data packets. It also takes care of the size, sequence and then transfers the data.

- session layer- it connects or terminates or authenticates or reconnects the destination computers to the session layer and confirms the connection between themselves.
- presentation layer-it makes the data presentable so that it can be read or accepted by the application.
- application layer- this is the application where the data can be visually be seen.

Q3. Construct a binary tree using in order and postorder traversal given below.
Inorder Traversal: 9, 3, 15, 20, 7
Post Order Traversal: 9, 15, 7, 20, 3 (10 marks)

ANS:-



In inorder the it follows left-root-right traversal

15's a root and its left is 9,3,20

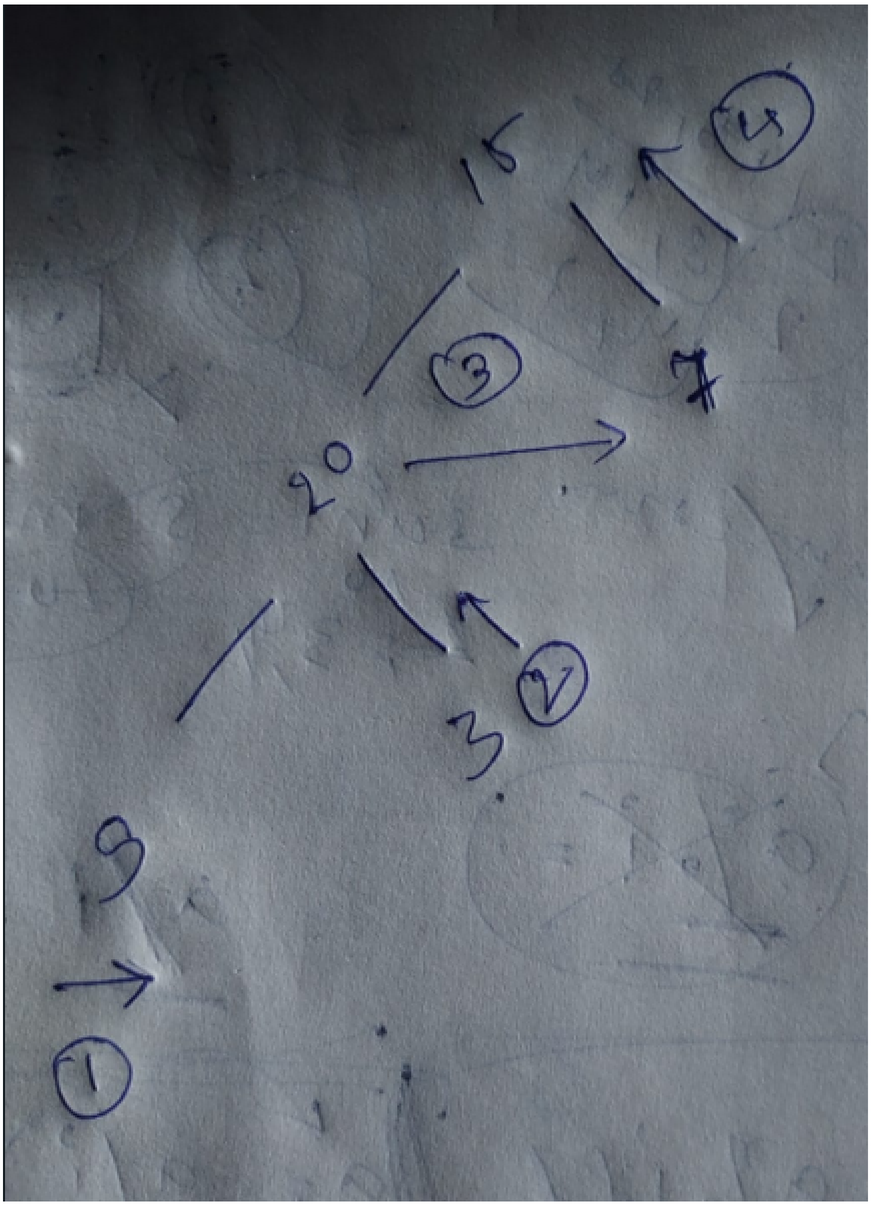
15’s a root and its right 7

3’s a root and its left is 9

3’s a root and its right is 20

9->3->20->15->7

```
class Node:
        def __init__(self, root):
                self.val =root
                self.left = None
                self.right = None
root = Node(15)
root.left = Node(3)
root.left.left = Node(9)
root.left.right = Node(20)
Root.right = Node(7)
```



In postorder it follows left-right-root traversal

15’s a root and its left is 9,20,3

15’s a root and its right 7

20’s a root and its left is 9

20’s a root and its right is 3

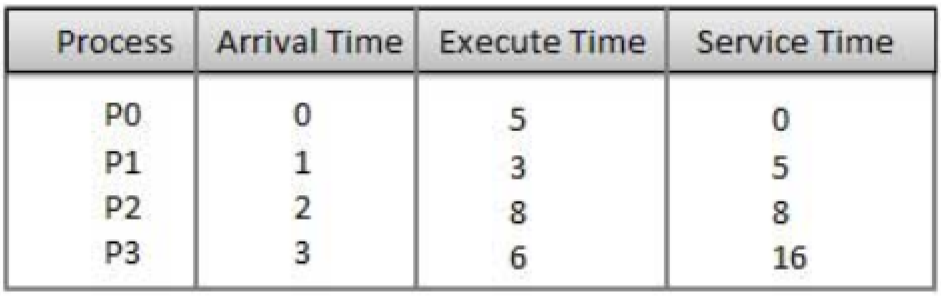
9->3->20->7->15

```
class Node:
        def __init__(self, root):
                self.val =root
                self.left = None
                self.right = None
root = Node(15)
root.left = Node(20)
root.left.left = Node(9)
root.left.right = Node(3)
root.right = Node(7)
```

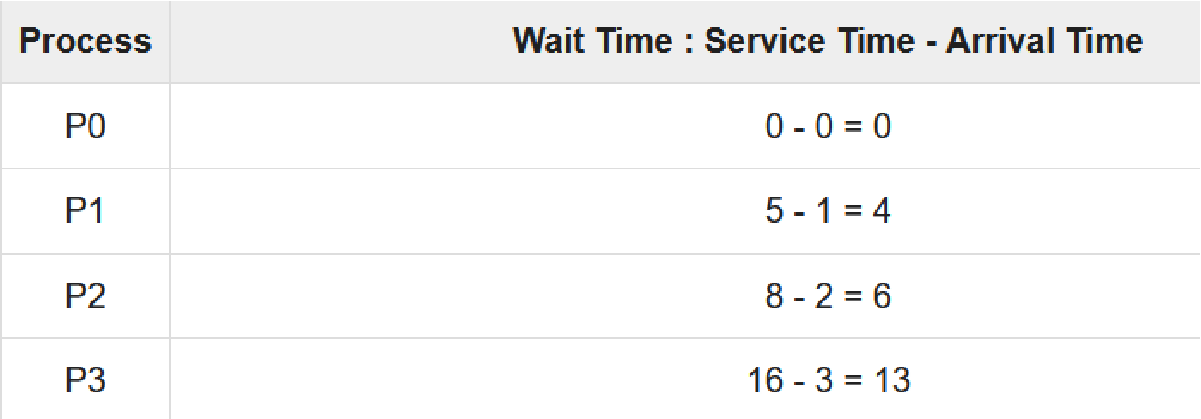
Q6. Explain any 3 Scheduling algorithms with an example. (10 marks)
ANS:-

## First Come First Serve

- Easy to implement and understand as well.
- Because the waiting time is high, it is poor in performance.
- Uses FIFO queue.



| Process | Arrival Time | Execute Time | Service Time |
|---|---|---|---|
| P0 | 0 | 5 | 0 |
| P1 | 1 | 3 | 5 |
| P2 | 2 | 8 | 8 |
| P3 | 3 | 6 | 16 |



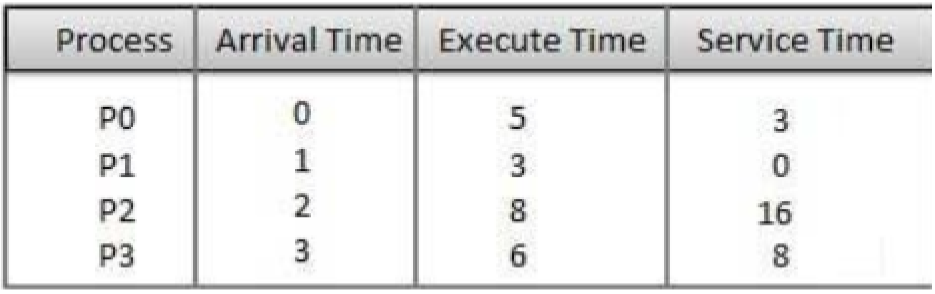
| Process | Wait Time : Service Time - Arrival Time |
|---|---|
| P0 | 0 - 0 = 0 |
| P1 | 5 - 1 = 4 |
| P2 | 8 - 2 = 6 |
| P3 | 16 - 3 = 13 |

The average waiting time is = (0+4+6+13)/4 = 5.75

## Shortest Job Next

- This is the best practice to minimize waiting time.
- This is the shortest path service.

| Process | Arrival Time | Execution Time | Service Time |
|---|---|---|---|
| P0 | 0 | 5 | 0 |
| P1 | 1 | 3 | 5 |
| P2 | 2 | 8 | 14 |
| P3 | 3 | 6 | 8 |



| Process | Arrival Time | Execute Time | Service Time |
|---|---|---|---|
| P0 | 0 | 5 | 3 |
| P1 | 1 | 3 | 0 |
| P2 | 2 | 8 | 16 |
| P3 | 3 | 6 | 8 |

| Process | Waiting Time |
|---|---|
| P0 | 0 - 0 = 0 |
| P1 | 5 - 1 = 4 |
| P2 | 14 - 2 = 12 |
| P3 | 8 - 3 = 5 |

Average wait time: (0 + 4 + 12 + 5)/4 = 21/4 = 6

## Shortest Remaining Time

- It is used in batch environment where the preference is given to shortest job.
- It is preemptive version
- The processor is allocated to the job closest to completion but it can be preempted by a newer ready job with shorter time to completion.