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## Module - 1

2) a. Virtual machines use the hardware part of the system in executing environment.

In this illusion the hardware part of the system in executing environment will be its own private held in computer.

This illusion process has the sep separate processor. So memory host os is the main os all other os installed are called guest os.

|           |                            |                                |                 |                 |
|-----------|----------------------------|--------------------------------|-----------------|-----------------|
|           |                            | Processes                      |                 |                 |
|           |                            |                                | Processes       |                 |
| Processes | ← Processes implementation |                                |                 | Processes       |
| Kernel    |                            | Kernel                         | Kernel          | Kernel          |
| Hardware  |                            | VM <sub>1</sub>                | VM <sub>2</sub> | VM <sub>3</sub> |
|           |                            | Virtual machine implementation |                 |                 |
|           |                            | Hardware                       |                 |                 |

b) There are six types of System Calls:

- 1) process control
- 2) file management
- 3) device management
- 4) Information management.
- 5) Communication

## 6) Protection

- Process Control :- <sup>controls</sup> ~~lets~~ the input mode.

in the process of the system.

- file management :- manages all the files of the system

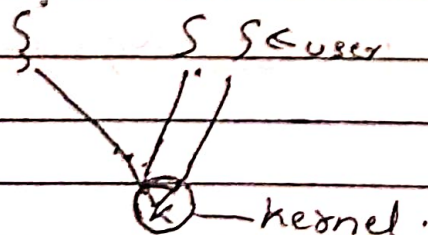
- device management :- manages the devices in the system

- Information management :- Gives the information to the system.

- Communication :- communicates with the system.

## Module - 2

- 3) b) • many to one threading model ✓



→ many user to one kernel

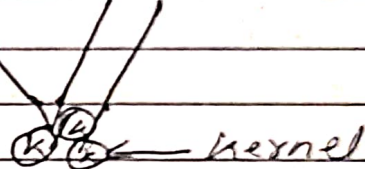


- One to ~~many~~ <sup>one</sup> threading model  
S ← user.



one user to one kernel

- many to many  
S S S ← user



many to less or more kernels

x Above mentioned are the different types of multi threading models.

4) a)

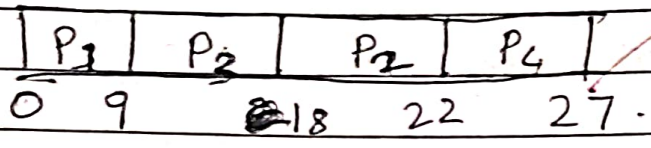
| Process        | A.T | Burst time | Priority |
|----------------|-----|------------|----------|
| P <sub>1</sub> | 0   | 9          | 3        |
| P <sub>2</sub> | 1   | 4          | 2        |
| P <sub>3</sub> | 2   | 9          | 1        |
| P <sub>4</sub> | 3   | 5          | 4        |

FCFS.

| Process        | A.T | B.T | Priority | W.T | TAT |
|----------------|-----|-----|----------|-----|-----|
| P <sub>1</sub> | 0   | 9   | 3        | 9   | 9   |
| P <sub>2</sub> | 1   | 4   | 2        | 18  | 17  |
| P <sub>3</sub> | 2   | 9   | 1        | 22  | 20  |
| P <sub>4</sub> | 3   | 5   | 4        | 27  | 24  |

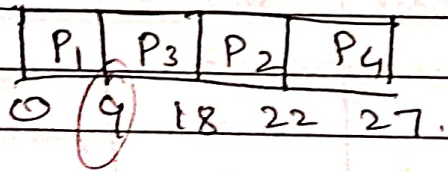
$TAT = A.T - W.T$

~~P<sub>1</sub> P<sub>3</sub> P<sub>3</sub> P<sub>2</sub> P<sub>1</sub> P<sub>4</sub>~~ preemptive



SRTF

| Process        | A.T | B.T | Priority | W.T | TAT |
|----------------|-----|-----|----------|-----|-----|
| P <sub>1</sub> | 0   | 9   | 3        | 9   | 9   |
| P <sub>2</sub> | 1   | 4   | 2        | 18  | 17  |
| P <sub>3</sub> | 2   | 9   | 1        | 22  | 20  |
| P <sub>4</sub> | 3   | 5   | 4        | 27  | 24  |



~~P<sub>1</sub>~~

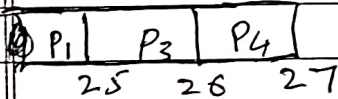
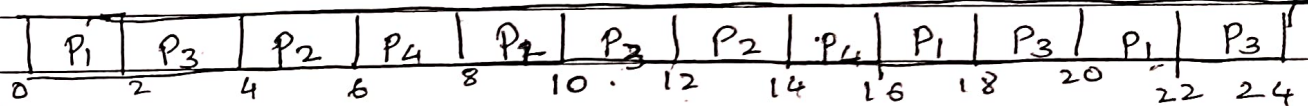
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Round robin:  $q = 2ms$

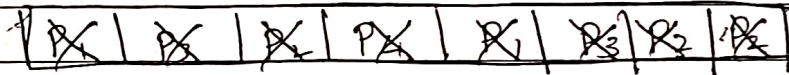
| Process        | A.T | B.T   | Priority | W.T | TAT |
|----------------|-----|---|----------|-----|-----|
| P <sub>1</sub> | 0   | <del>9</del> <del>7</del> <del>5</del> <del>1</del> | 3        | 9   | 9   |
| P <sub>2</sub> | 1   | <del>4</del> <del>2</del> <del>0</del>              | 2        | 18  | 17  |
| P <sub>3</sub> | 2   | <del>9</del> <del>7</del> <del>5</del> <del>1</del> | 1        | 22  | 20  |
| P <sub>4</sub> | 3   | <del>8</del> <del>3</del> <del>0</del>              | 4        | 27  | 24  |

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Running queue.  
Ready queue



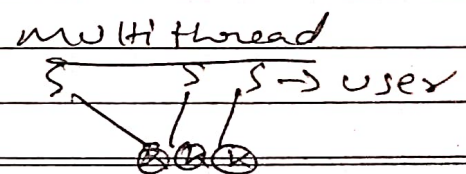
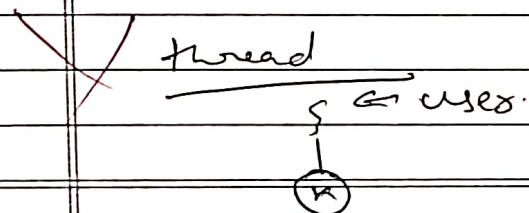
Ready Queue



b) Distinguish btw process & threads

Process  
 has high memory  
 storage

threads.  
 has low memory  
 storage.





Q.13

- 1) a) ✓
- 2) a) ✓
- 3) b) ✓
- 4) b) ✓
- 5) d) ✓