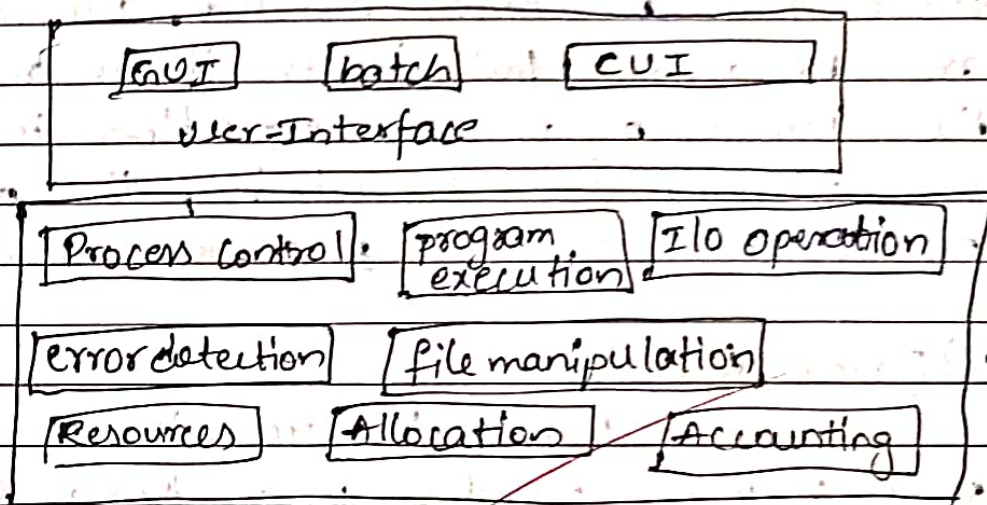


OS

Q.2)

1a) Operating system is a interface between the user of the computer and the computer hardware.

Services of Operating Systems:-Services of Operating System1) Process Control:-

process control in the operating systems ~~are~~ starts or controls the memory in the computer.

2) User-Interface:-

User-interface consists of three parts:

- 1) Graphical user-interface:- This is used when a user gives input from a keyboard or mouse
- 2) batch interface
- 3) Control-user-interface:- This interface is used in the software of the computers.

### 3) Program execution:-

The user gives the input to the system, it fetches the information from the memory and executes the program.

### 4) I/O operation:-

Input and Output are the two main services that are being provided. I/O operations are based on the inputs it is received and the memory to program execution is executed. Once the program is executed, the I/O service provides the output on the monitor.

### 5) Error detection:-

Error detection is one of the main service work of the user based services. Because of one error there is a chance that the execution is collapsed or maybe the system does not work well.

### 6) File Manipulation:-

File manipulation is the service that is provided to write the contents of one file to another file. To read or copy a file we first have to create a file and then copy the contents of one file to another file. Deleting can also be done in the files.



## System-based services:-

### 1) Resources:-

The system provides the user with many resources which can be used by the users. These resources are explicitly arranged and the users can use these resources.

### 2) Allocation:-

The resources that this operating system has, these to be allotted to the respective users so that no misuse or manipulation can be happened. So the system allocates the resources it has to the users.

### 3) Accounting:-

The resources that are been provided to the users has to maintained properly. To maintain these things the system services also has another service called as accounting.

## 1b) (i) Multi-processor system

→ These are provided by many CPU's in a single system.

→ If one system or CPU is blocked it can have other CPU's to work on them.

→ At least if  $N$  no. of processors are also increased then also we don't have fast change in speed.

→ In multi-processor system the wait time is more than clustered system.

→ For an I/O operation the after input there is a time to execute the op at that time the processor goes to the other operation and completes them.

## Clustered System

→ These are different systems that are connected via network.

→ If any of the system CPU's are blocked, it does not affect the other operations taking place in them.

→ If  $N$  processors are increased then there is a chance that the performance speed might increase.

→ In clustered system the wait time less compared to the multi-processor system.

→ The wait time is very low that the user feels that the whole all operations are being executed at the same time.

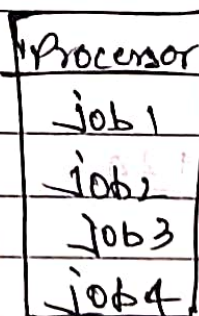


## 1b) (ii) Multiprogramming

→ In multiprogramming, the CPU does not sit idle, since whenever there is a delay from the user, it goes to the next operation.

→ In <sup>multiprogramming</sup> there is a master and slave process. Here all the systems do not have CPU's but registers are present.

→ In multiprogramming, the jobs come in a line from the job pool. It executes the jobs one by one.



## Multitasking

→ In multitasking, also the CPU never sits idle and it works so fast that it seems like all the operations are being executed at the same time.

→ In multitasking, all the systems are treated as peers and every system has its own CPU.

→ In multitasking, since many CPU's are there, the performance is very fast.



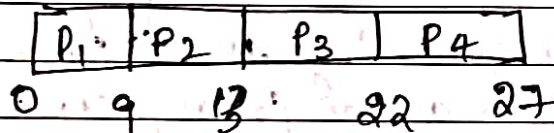
4a)

Process	Arrival Time	BT	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

ii) FCFS:-

	AT	BT	priority	CT	CT-AT	WT
					TAT	TAT-BT
P <sub>1</sub>	0	9	3	9	9	0
P <sub>2</sub>	1	4	2	13	12	8
P <sub>3</sub>	2	9	1	22	20	11
P <sub>4</sub>	3	5	4	27	24	19

Gantt chart



$$\text{Average WT} = \frac{0+8+11+19}{4}$$

$$= 9.5 \text{ ms}$$

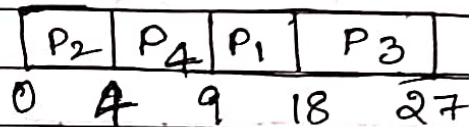
$$\text{Average TAT} = \frac{9+12+20+24}{4}$$

$$= 16.25$$

(i) SRTF:-

	AT	BT	Priority	CT	CT-AT	TAT-BT
					TAT	Wt
P <sub>1</sub>	0	9	3	18	18	9
P <sub>2</sub>	1	4	2	4	3	
P <sub>3</sub>	2	9	1	27	25	
P <sub>4</sub>	3	5	4	9	6	

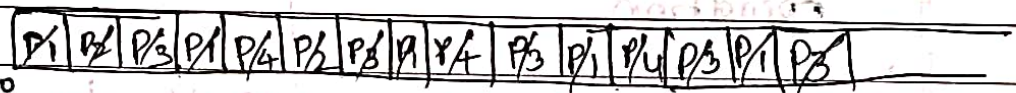
Gantt chart:-



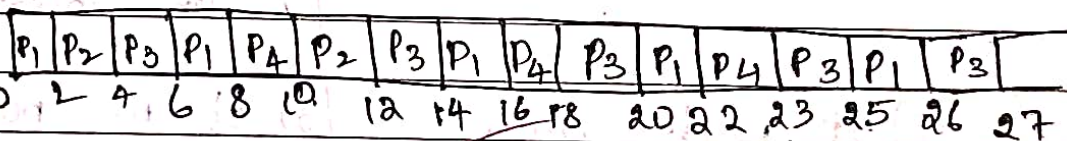
(ii) Round Robin ( $q = 2ms$ )

	AT	BT	priority	CT	CT-AT	TAT-BT
					TAT	Wt
P <sub>1</sub>	0	<del>9</del> 5	3	26	26	17
P <sub>2</sub>	1	<del>4</del> 0	2	12	11	7
P <sub>3</sub>	2	<del>9</del> 3	1	27	25	16
P <sub>4</sub>	3	<del>5</del> 3	4	23	20	15

ready queue



running queue



Average TAT = 20.5

Average Wt = 13.75



(iv) priority:-

lower priority number represent higher priority.

	AT	BT	Priority	CT	$TAT = AT - BT$	WT	$TAT - BT$
P <sub>1</sub>	0	98	3	22	22	13	1
P <sub>2</sub>	1	43	2	14	13	9	1
P <sub>3</sub>	2	98	1	11	9	0	1
P <sub>4</sub>	3	5	4	27	24	21	1

$P_1$	$P_2$	$P_3$	$P_3$	$P_2$	$P_1$	$P_4$	
0	1	22	3	11	14	22	27

$$\frac{148}{22}$$

$$Avg TAT = 17 ms$$

$$Avg WT = 10.75 ms$$

QUIZZY-

4b)

Process

Thread

1) It is a heavyweight operation

1) It is a lightweight operation

2) It needs an interface

2) It does not require an interface

3) It needs many resources

3) It does not need many resources.



1) they are not dependent on each other

4) They are dependent

### QUIZ:-

1) ~~b~~ X

2) ~~a~~ ✓

3) ~~b~~ ✓

4) ~~b~~ ✓

5) ~~b~~ ✓