

(SJF) (Non - Preemptive Shortest Job First):

P <sub>2</sub>	P <sub>1</sub>	P <sub>4</sub>	P <sub>3</sub>
0	3	8	14 22

The order of execution is based on burst time.

P<sub>2</sub> executes from 0ms to 3ms (burst time = 3ms)

P<sub>1</sub> executes from 3ms to 8ms (burst time = 5ms)

P<sub>4</sub> executes from 8ms to 14ms (burst time = 6ms)

P<sub>3</sub> executes from 14ms to 22ms (burst time = 8ms)

Round Robin (Quantum = 4ms)

P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>	P <sub>1</sub>	P <sub>3</sub>	P <sub>4</sub>
0	4	7	11	15	16	20 22

Processes are executed in cyclic manner with each process getting a time slice of 4ms.

Process P<sub>1</sub> is executed for 4ms (remaining burst time = 1ms)

Process P<sub>2</sub> is executed for 3ms (completed)

Process P<sub>3</sub> is executed for 4ms (remaining burst time = 4ms)

Process P<sub>4</sub> is executed for 4ms (remaining burst time = 2ms)

Process P<sub>1</sub> is executed for 1ms (completed)

Process P<sub>3</sub> is executed for 4ms (completed)

Process P<sub>4</sub> is executed for 2ms (completed)

(b) FCFS:

Waiting Times: P<sub>1</sub> = 0, P<sub>2</sub> = 5, P<sub>3</sub> = 8, P<sub>4</sub> = 16

Turnaround times: P<sub>1</sub> = 5, P<sub>2</sub> = 8, P<sub>3</sub> = 16, P<sub>4</sub> = 22

Average waiting time =  $(0 + 5 + 8 + 16) / 4 = 7.25 \text{ ms}$

Average turnaround time =  $(5 + 8 + 16 + 22) / 4 = 12.75 \text{ ms}$



SJF:

Waiting times:  $P_2 = 0, P_1 = 3, P_4 = 8, P_3 = 14$

Turnaround times:  $P_2 = 3, P_1 = 8, P_4 = 14, P_3 = 22$

Average waiting time =  $(0 + 3 + 8 + 14) / 4 = 6.25 \text{ ms}$

Average turnaround time =  $(3 + 8 + 14 + 22) / 4 = 11.75 \text{ ms}$

Round Robin ( $q = 4$ ):

Finish times:  $P_1 = 16, P_2 = 7, P_3 = 20, P_4 = 22$

Turnaround times: finish - arrival = same as Finish  
 $P_1 = 16, P_2 = 7, P_3 = 20, P_4 = 22$

Waiting times: turnaround - burst

$P_1 = 11, P_2 = 4, P_3 = 12, P_4 = 16$

Average waiting time =  $(11 + 4 + 12 + 16) / 4 = 10.75 \text{ ms}$

Average turnaround time =  $(16 + 7 + 20 + 22) / 4 = 16.25 \text{ ms}$

- (c) SJF gives lowest waiting and turnaround times so it balances throughput and efficiency best.

9. (i) Migration to Cloud Infrastructure:

(a) A microkernel or layered OS architecture is most suitable because it provides scalability, modularity, and stronger isolation. This helps maintain security and stability when multiple cloud services run simultaneously.

(b) Virtual machines (VMs) support cloud migration by offering isolation (one VM's failure doesn't affect others), management (easy snapshots, migration and deployment) & resource optimization (efficient sharing of CPU, memory & storage across workloads).



## (ii) Smart Home IOT System

- (a) The OS ensures timely responses by using priority-based scheduling so critical tasks like intrusion detection preempt lower-priority ones. IPC mechanisms (e.g. message queues or signals) allows fast communication between devices and the central controller.
- (b) Real-time algorithms such as Earliest Deadline First (EDF) or Rate Monotonic Scheduling (RMS) are suitable because they guarantee deadlines for high-priority tasks while still allowing less critical tasks to execute efficiently.