1) **Describe real-time systems. What is the difference between hard and soft real-time systems?**

A real time system means that there is something significant and important about its response time, involving real time scheduling. This will provide a certain level of guarantee that the system response is within some deadline.

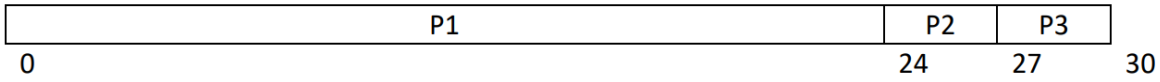
2) **Compare the waiting time, turnaround time and response time scheduling criteria.**

Waiting time : we focus on the time between the arrival time of the process and the scheduled time, which is the time taken for a process to wait in the ready queue

Turnaround time : the time taken to execute a particular process which includes the waiting time in memory and ready queue (executing in the CPU and doing IO)

Response time : the amount of time it takes from when request was submitted until first response is produced, but this does not include the final/overall product

3) **Consider an FCFS scheduler for P1, P2 and P3 as shown below (arrived in this order). Draw the Gantt chart and calculate the average waiting time.**



Waiting time P1 = 0

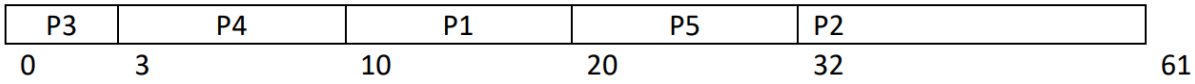
Waiting time P2 = 24

Waiting time P3 = 27

Average waiting time : (0 + 24 + 27)/3 = 17

4) **Draw the Gantt charts for the SJF, and RR schedulers, and calculate the average waiting time for each.**

For SJF:

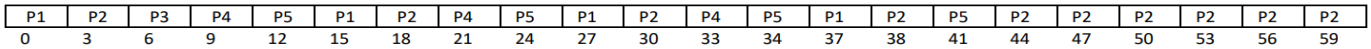


Average waiting time : (10 + 32 + 0 + 3 20)/5 = 13

For RR :

Assumption : quantum of 3

Gantt chart :



Waiting time :

P1 = 0 + 12 + 9 + 7 = 30

P2 = 3 + 23 + 9 + 5 + 3 = 32

P3 = 6

P4 = 9 + 9 + 9 = 27

P5 = 12 + 9 + 7 + 4 = 32

Average waiting time = (30 + 32 +6 + 27 + 32)/ 5 = 25.4

5) **What are the two types of latencies that affect the real-time scheduling performance? Explain.**

Interrupt latency is the time taken from arrival of interrupt to the start of the routine that services the interrupt. This is equivalent to the time taken to finish executing the current instruction, the time to determine the interrupt type and the context switch time

On the other hand, dispatch latency is the time taken for the scheduler to take the current process off CPU and switch to another. The conflict phase of dispatch latency are pre-emption of any process running in kernel mode of the OS. It is released by low-priority process of resources needed by high-priority process.