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Level : 2LMD	**Date: April 2024**	**Module** : Operating Systems 1

Series 3: Process scheduling

Exercise 1:

Consider the following different processes:

Process	Arrival time	CPU Burst
P1	0	3
P2	2	6
P3	4	4
P4	6	5
P5	8	2

Give the Gantt chart of these different processes by successively using:

1. FCFS: First Come First Served (FIFO).
2. SJF: Shortest Job First.
3. SRTF: Shortest remained Time First.
4. RR: Round Robin (quantum = 4 units).

For each studied case, calculate:

• Turnaround time of each process and average turnaround time.
• Waiting time of each process and average waiting time.
• CPU utilization rate.

Exercise 2:

For the processes in the following table, draw a diagram illustrating their execution, using priority scheduling. A higher priority number corresponds to a higher priority. Perform the exercise in a preemptive and non-preemptive approach. Then calculate the turnaround time of each process, the average turnaround time, the waiting time of each process, the average waiting time and CPU utilization rate.

Process	Burst	Priority	Arrival Time
P_1	8	4	0
P_2	6	1	2
P_3	1	2	2
P_4	9	2	1
P_5	3	3	3

Exercise 3:

We consider a monoprocessor system and four processes P1, P2, P3 and P4 which carry out calculations and inputs/outputs with a disk according to the times given opposite. Processes are available from the start, in that order.

1) We consider that the scheduling on the processor is done according to a preemptive priority policy: the process elected at a time t is the one which is the ready process with the highest priority.

We give: priority (P1) > priority (P3) > priority (P2) > priority (P4). It is considered that the service order of I/O requests for the disk is always done according to a FIFO policy.

- Draw the execution diagram, and calculate the average turnaround time.

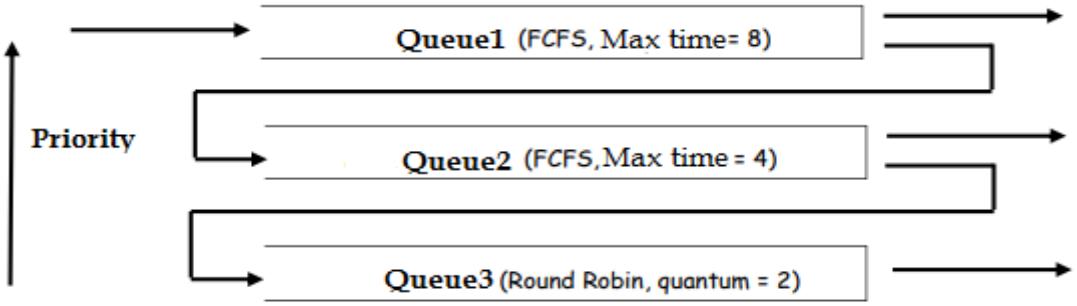
	P1	P2	P3	P4
CPU Burst	3	4	2	7
I/O	7	3	3	
CPU Burst	2	2	2	
I/O	1	1		
CPU Burst	1	1		

2) It is considered that the scheduling on the processor is done according to a Round Robin policy with a quantum of 2 time units. It is assumed that the order of arrival was P1 then P2 then P3 then P4. It is considered that the order of services of the I/O requests for the disk is done in FIFO.

- Draw the Gantt diagram of processes execution and give the average turnaround time obtained.
- Compare results in question 1 and 2.

Exercise 4:

We consider the following multilevel scheduling and feedback technique:



- Queue 1 has the highest priority. A newly created process is placed in File1 which is managed according to the FCFS algorithm.
- When a process in Queue 1 gets the CPU, it is granted a max time of 08 time units, if he does not finish he is moved to queue 2.
- Queue 2 is also managed according to FCFS scheduling, but a maximum time of 4 is given units of time to each process. If the process does not terminate, it is moved in queue 3.
- Queue 3 is managed according to Round Robin scheduling with a quantum equal to 2.

1. Explain the interest of this scheduling method.
2. Provide the Gantt chart for the following scenario:

Process	Arrival time	Burst
P1	0	16
P2	0	14
P3	0	10
P4	0	20
P5	0	6