Operating systems

Module 5

More CPU scheduling

PART I

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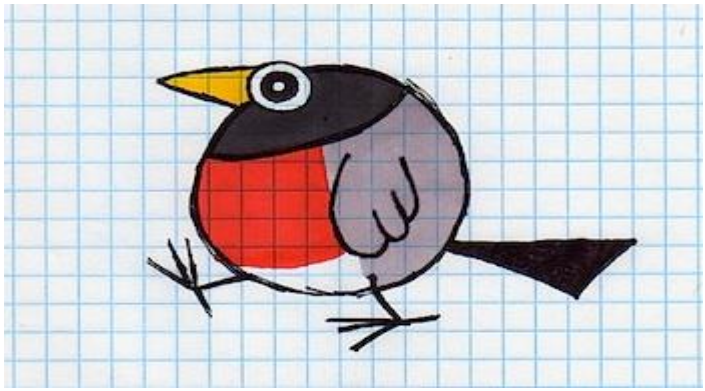
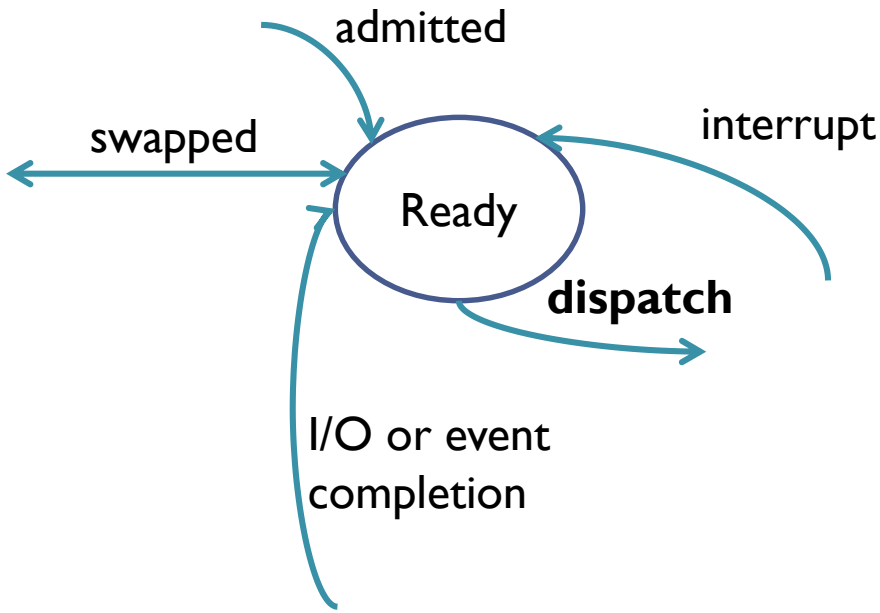
UNIT 5 – CPU SCHEDULING

- CPU scheduling calculations
- CPU scheduling algorithms
- CPU scheduling Practice
  - Round Robin
  - Shortest remaining Time (SRT)



CPU SCHEDULING

- **Short term scheduler (CPU scheduler)** selects from among the processes in ready queue, and allocates the CPU to one of them



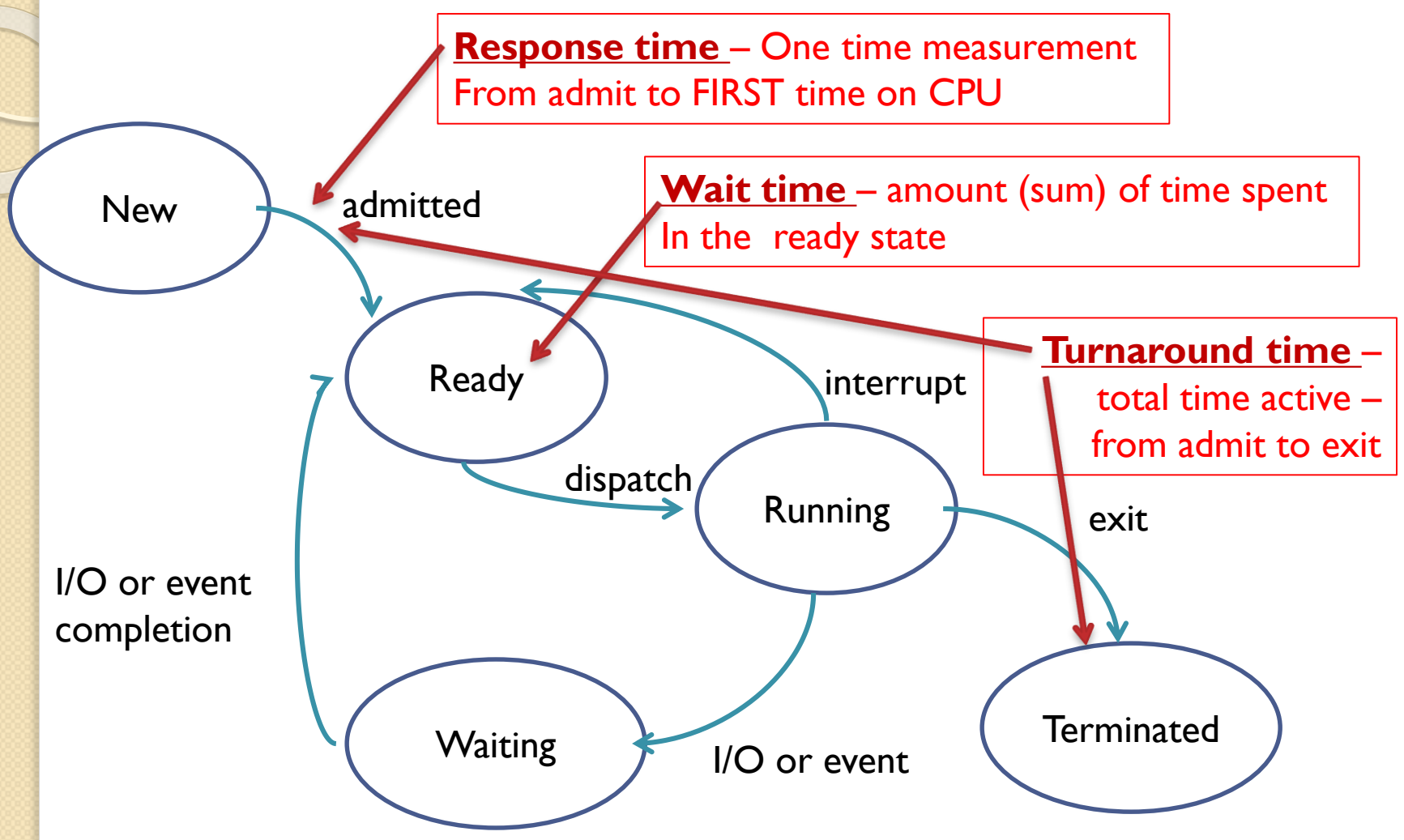
CPU SCHEDULING

- **CPU burst** – time on the CPU

CPU scheduling Calculations –

- ***CPU utilization-***
  - % CPU works - Sum of actual work time/total time
- ***Throughput*** –
  - number of processes completed in amount of time
- ***Turnaround time*** -
  - from time of admit to time of completion
  - Sum of periods spent waiting, ready queue, I/0, CPU
- ***Waiting time*** –
  - sum of periods spent waiting (in **ready** state)
- ***Response time*** –
  - From time of submission until first response

PROCESS STATES



CPU SCHEDULING ALGORITHMS

Nonpreempitve	***Preemptive***
FCFS –	**Round Robin**
SJF -	**SJR – shortest remaining time**
Priority -	**Preemptive priority**

Combination algorithms :

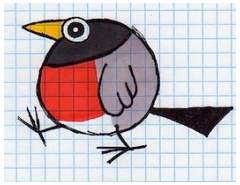
MLQ – Multilevel Queue

(stay in the same queue)

MLFQ - Multilevel Feedback Queue

(may migrate to another queue)

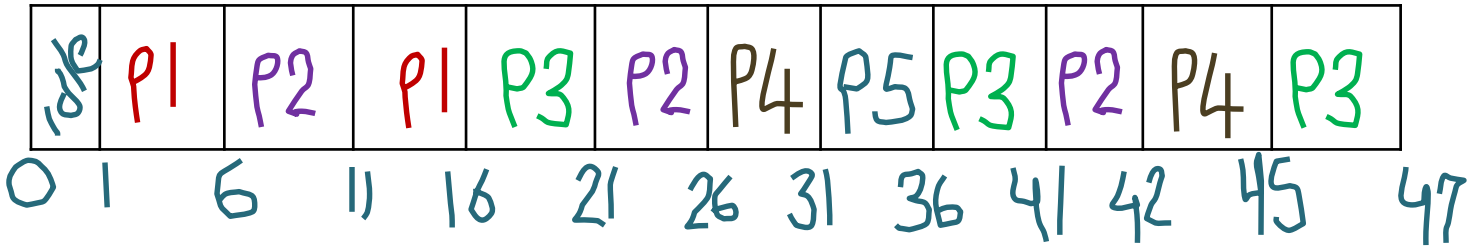
CPU SCHEDULING PRACTICE



preempitve example (using Gantt chart):

Round Robin (TQ 5)

Process	Burst	Arrival Time	RT	WT	TT
P1	10 5	1 6	0	0 + 5 = 5	15
P2	11 6 1	6 11 26	0	0+10+15=25	36
P3	12 7 2	8 21 41	8	8+15+4= 27	39
P4	8 3	12 31	14	14+11= 25	33
P5	5	14	17	17	22



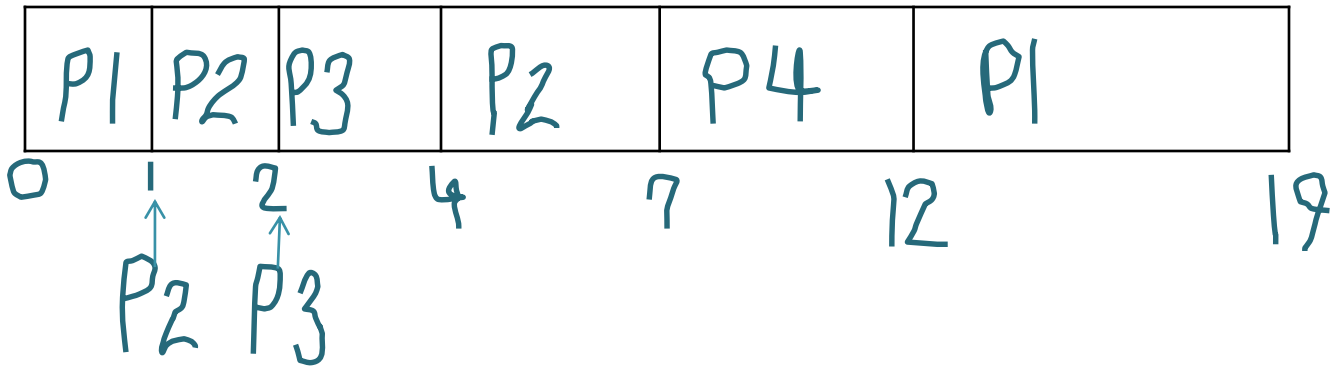
CPU SCHEDULING PRACTICE

preempitve examples (using Gantt chart):

SRT – Shortest remaining time

(shortest job first preemptive)

Process	Burst	Arrival time	RT	WT	TT
P1	~~8~~ 7	~~0~~ 1	0	11	19
P2	~~4~~ 3	~~1~~ 2	0	2	6
P3	~~2~~	~~2~~	0	0	2
P4	5	3	4	4	9



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PART II

MODULE 5 – CPU SCHEDULING

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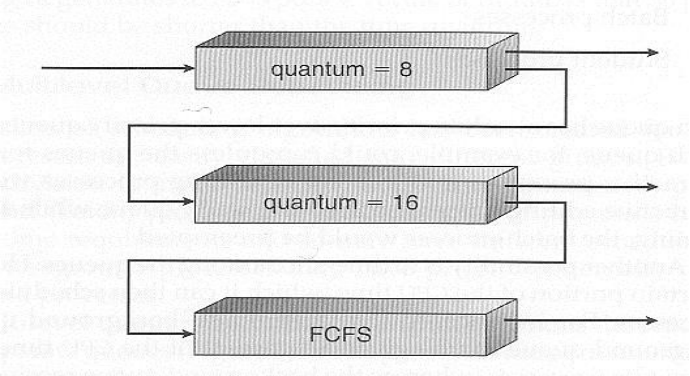
- CPU scheduling Practice
  - Multilevel Queue (MLQ)
  - Multilevel Feedback Queue (MLFQ)



CPU SCHEDULING PRACTICE

Combination algorithms :

MLQ – Multilevel Queue

(stay in the same queue)

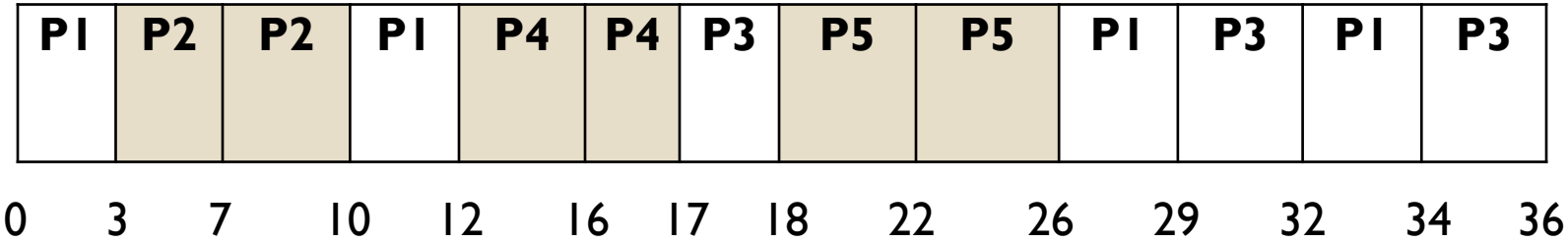
MLFQ - Multilevel Feedback Queue

(may migrate to another queue)

MLQ - CPU SCHEDULING PRACTICE

Apply multilevel queue scheduling (MLQ) consisting of two queues
(Queue 1 has higher priority over queue 2).
Both queues use Round Robin scheduling, with
Tq1=4 (Priority queue 1) and Tq2=3 (Priority queue 2).

Process	CPU burst time	Arrival time	Priority queue	RT	TT	WT
P1	10	0	2	0	34	24
P2	7	3	1	0	7	0
P3	6	4	2	13	32	26
P4	5	12	1	0	5	0
P5	8	18	1	0	8	0
			AVG	2.6	**17.2**	**10**



CPU SCHEDULING PRACTICE EXERCISE

1. FCFS
2. SJF
3. Multi-level Feed Back
   Queue with three queues (higher priority queues have absolute priority)
   - Queue1 - Round Robin with time quantum 4 (highest priority)
   - Queue 2 – Round Robin with time quantum 7
   - Queue 3 – First Come First Serve
4. Preemptive priority (1 is highest priority) (USE PRIORITY COLUMN)

Process	CPU, I/O, CPU	Arrival Time	Queue	Priority	RT	TT	WT
P1	5, 6, 7	0	1	3			
P2	4, 2, 3	3	1	2			
P3	2, 3, 4	4	1	1			
P4	5, 2, 7	7	1	3			
P5	3, 2, 4	14	1	2			