process	arrival time	Burst Time
P_0	2	3
P_1	0	7
P_2	2	4
P_3	4	1
P_4	5	4

FCFS

@ t=0 | P_1 | Schedules P_1 to run

@ t=2 | P_2 | P_0 | $P_1(5)$

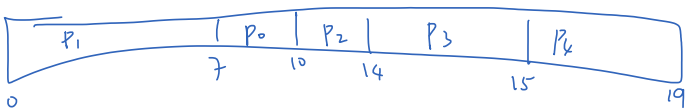
@ t=4 | P_3 | P_2 | P_0 | $P_1(3)$

@ t=5 | P_4 | P_3 | P_2 | P_0 | $P_1(2)$

@ t=7 | P_1 terminates.

time ↓

P_1 P_0 P_2 P_3 P_4



Waiting time = Completion time − Cpu burst − arrival time

P_0: 10 − 3 − 2 = 5

P_1: 7 − 7 − 0 = 0

P_2: 14 − 4 − 2 = 8

P_3: 15 − 1 − 4 = 10

P_4: 19 − 4 − 5 = 10 / 33

RR $q = 3$

P_0: 6 − 3 − 2 = 1

P_1: 18 − 7 − 0 = 11

P_2: 17 − 4 − 2 = 11

P_3: 13 − 1 − 4 = 8

P_4: 19 − 4 − 5 = 10

R.R. $q = 3$

@ t=0 | P_1 — P_1 → runs

@ t=2 | P_2 | P_0 — $P_1(5)$

@ t=3 P_1 is preempted, $P_1(4)$ | $P_1(4)$ | $P_2(4)$ | $P_0(3)$ — P_0 → runs

@ t=4 | $P_3(1)$ | $P_1(4)$ | $P_2(4)$ | $P_0(2)$

@ t=5 | $P_4(4)$ | $P_3(1)$ | $P_1(4)$ | $P_2(4)$ | $P_0(1)$

@ t=6 P_0 terminates, P_2 runs | $P_4(4)$ | $P_3(1)$ | $P_1(4)$

@ t=9 P_2 is preempted, P_1 runs | $P_1(1)$ | $P_4(4)$ | $P_3(1)$ | $P_1(4)$

@ t=12 P_1 is preempted, P_3 runs | $P_1(1)$ | $P_2(1)$ | $P_4(4)$ | $P_3(1)$

@ t=13 P_3 terminates, P_4 runs | $P_1(1)$ | $P_2(1)$ | $P_4(4)$

@ t=16 P_4 is preempted, P_2 runs | $P_4(1)$ | $P_1(1)$ | $P_2(1)$

@ t=17 P_2 terminates

18 P_1 ↓

19 P_4 ↓

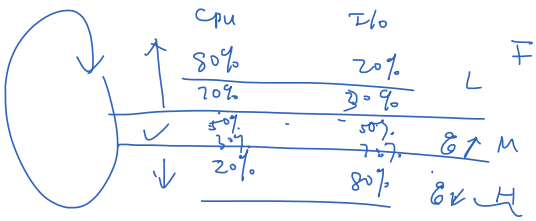
$\frac{dn}{dt} = \lambda$

arrival rate $= \frac{\sum_i C_i}{\sum_i C_i + \sum_j I_j}$

$f(\lambda)$

Q_0: if there is n_0 processes in Q_0.

$(n_0 - 1) \cdot \delta \; / \; (q_0)$



FCFS
- reduces # of context switch

RR
- good response
- maintains good locality

$(n_0-1)\cdot 8$ / q_{e_0}

n_1 . . . . . Q_1

$(n_1-1)\cdot q_{e_1}$

	arrival time	cpu burst
p_0	0	25
p_1	10	16
p_2	12	24
p_3	20	10

	Q_0 $q_e=8$	Q_1 $q_e=16$ 12	Q_2 FCFS
$t=0$	$P_0(25)$, run P_0	—	—
$t=8$	P_0 preempted —	$P_0(17)$, run P_0	
2ms $t=10$	$P_1(16)$, run P_1	$P_0(15)$	
$t=12$	$P_2(24)$ $P_1(14)$		
schedule P_2 to run $t=18$	$P_2(24)$	$P_1(8)$ $P_0(15)$	
$t=20$	$P_3(10)$ $P_2(22)$		
$t=28$	$P_3(10)$	$P_2(16)$ $P_1(8)$ $P_0(15)$	
$t=34$		$P_3(2)$ $P_2(16)$ $P_1(8)$ $P_0(15)$	
since we have run P_0 for 2ms, this round run P_0 for 10ms $t=44$		$P_3(2)$ $P_2(16)$ $P_1(8)$	$P_0(5)$
P_1 terminates $t=52$		$P_3(2)$ $P_2(16)$	$P_0(5)$
$t=64$		$P_3(2)$	$P_2(4)$ $P_0(5)$
P_3 terminates $t=66$	—	—	$P_2(4)$ $P_0(5)$

P_0 terminates $t=71$:

P_2 terminates $t=75$