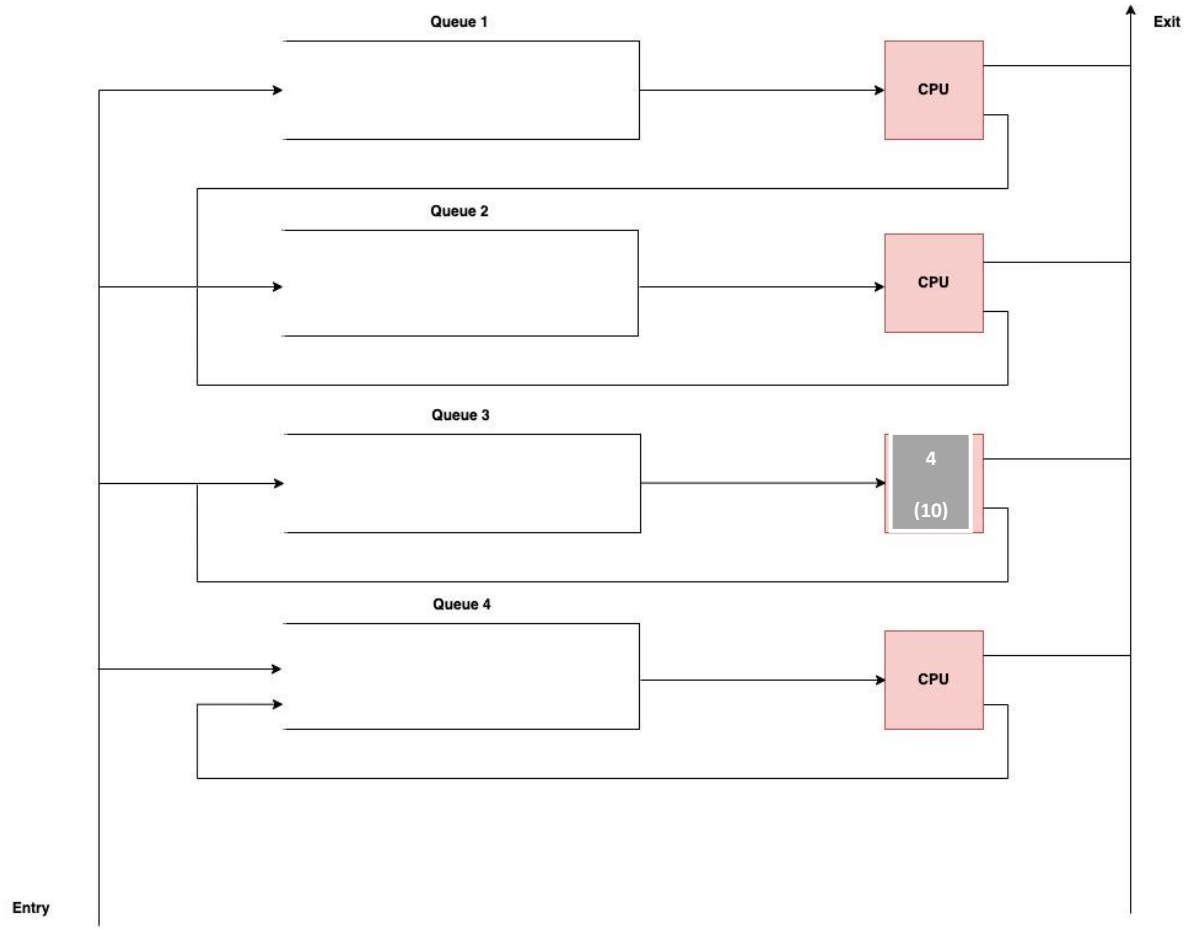
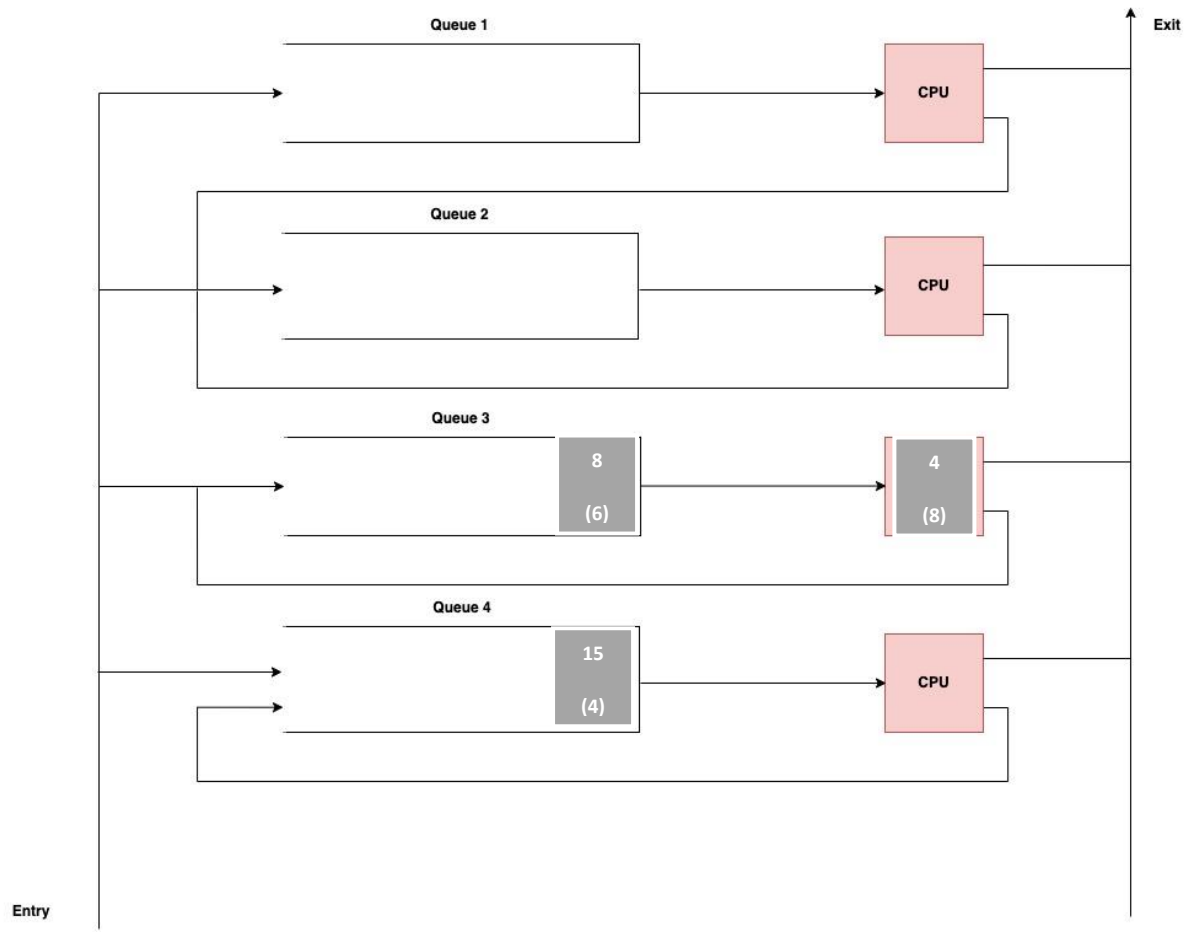


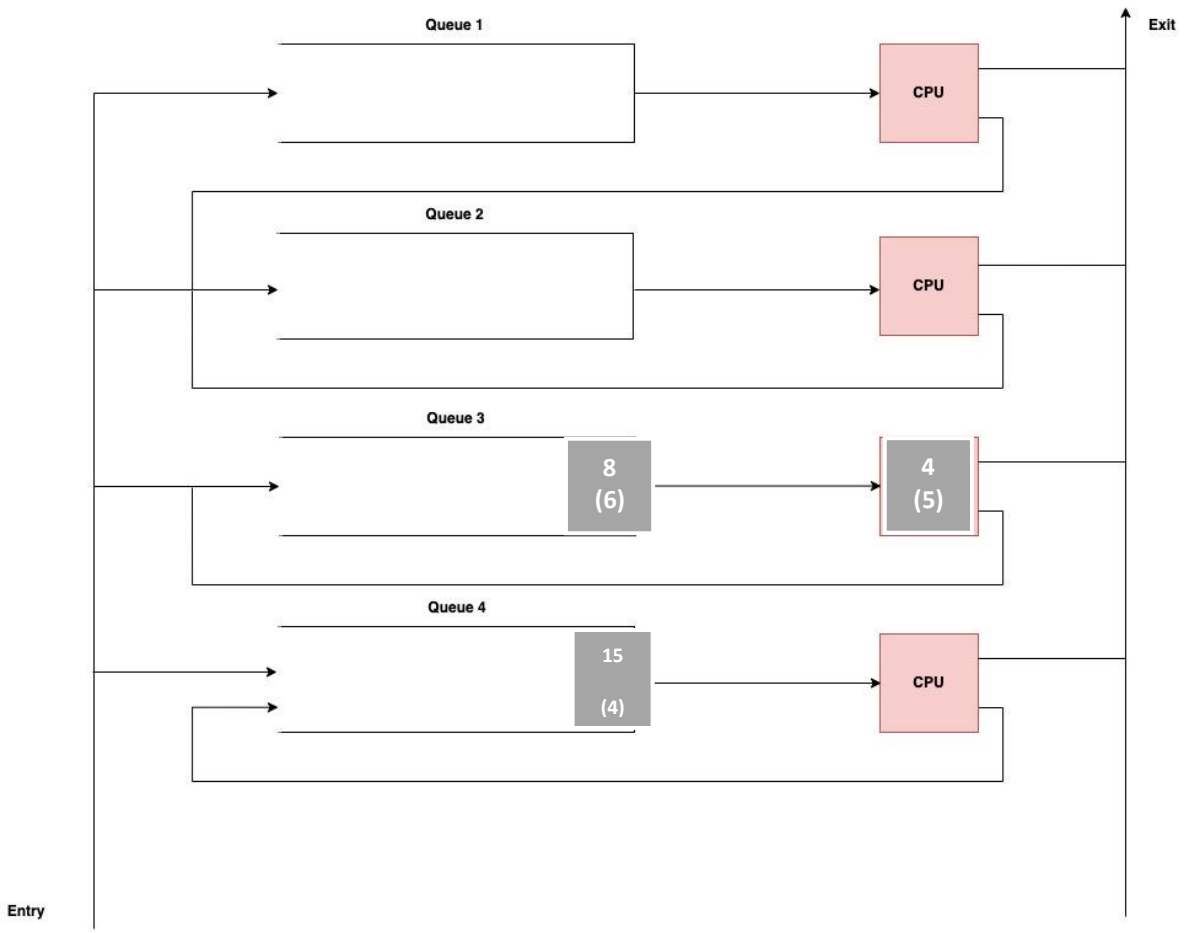
Time = 0

- Process (ID:4) arrives and starts operating since there is no other process using CPU or waiting in the queue.



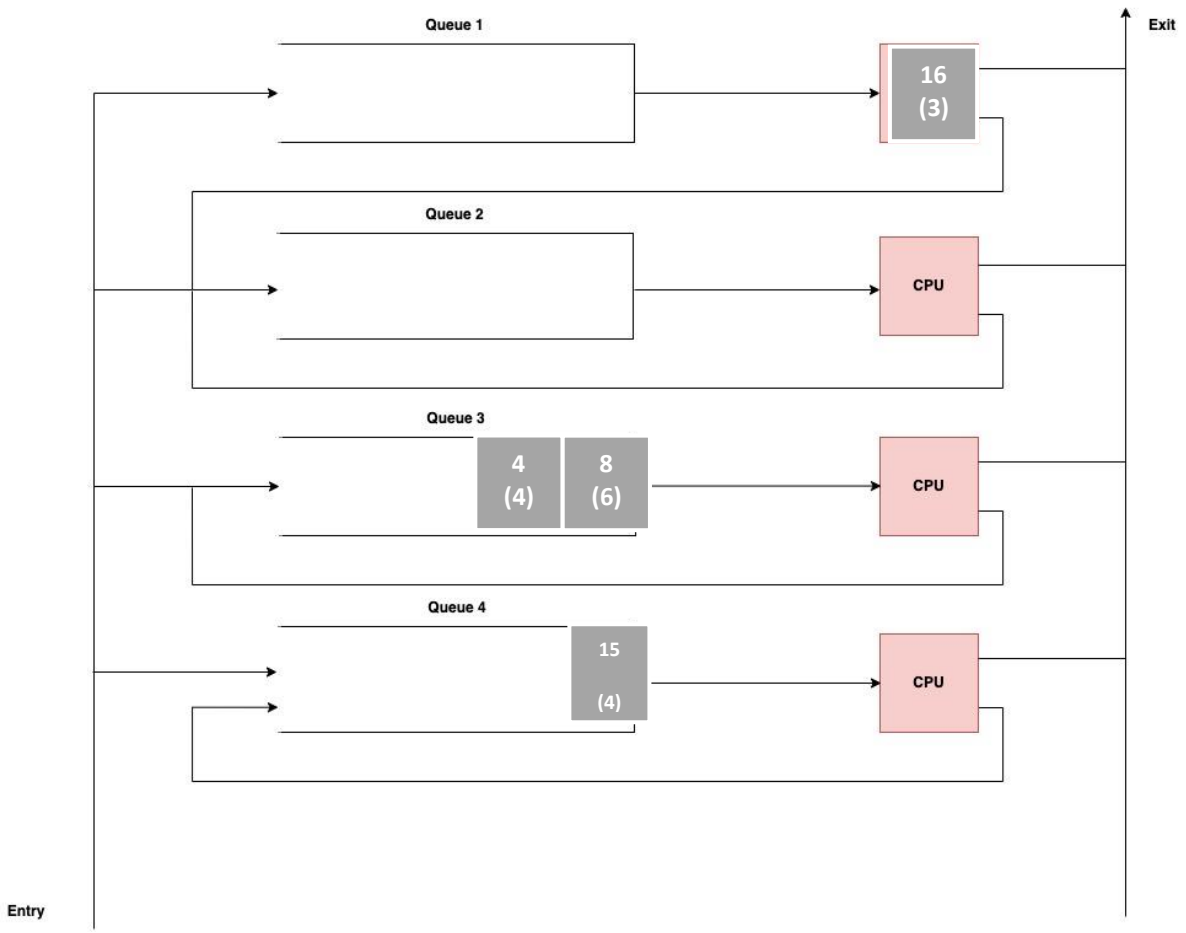
Time = 2

- Process (ID:8) and Process (ID:15) arrive and get in their queues (background and batch) since Process (ID:4) is using CPU.
- Process (ID:4) has 8 unit service time remaining and it will stop using CPU after 3 unit time since quantum value for this queue is 5.



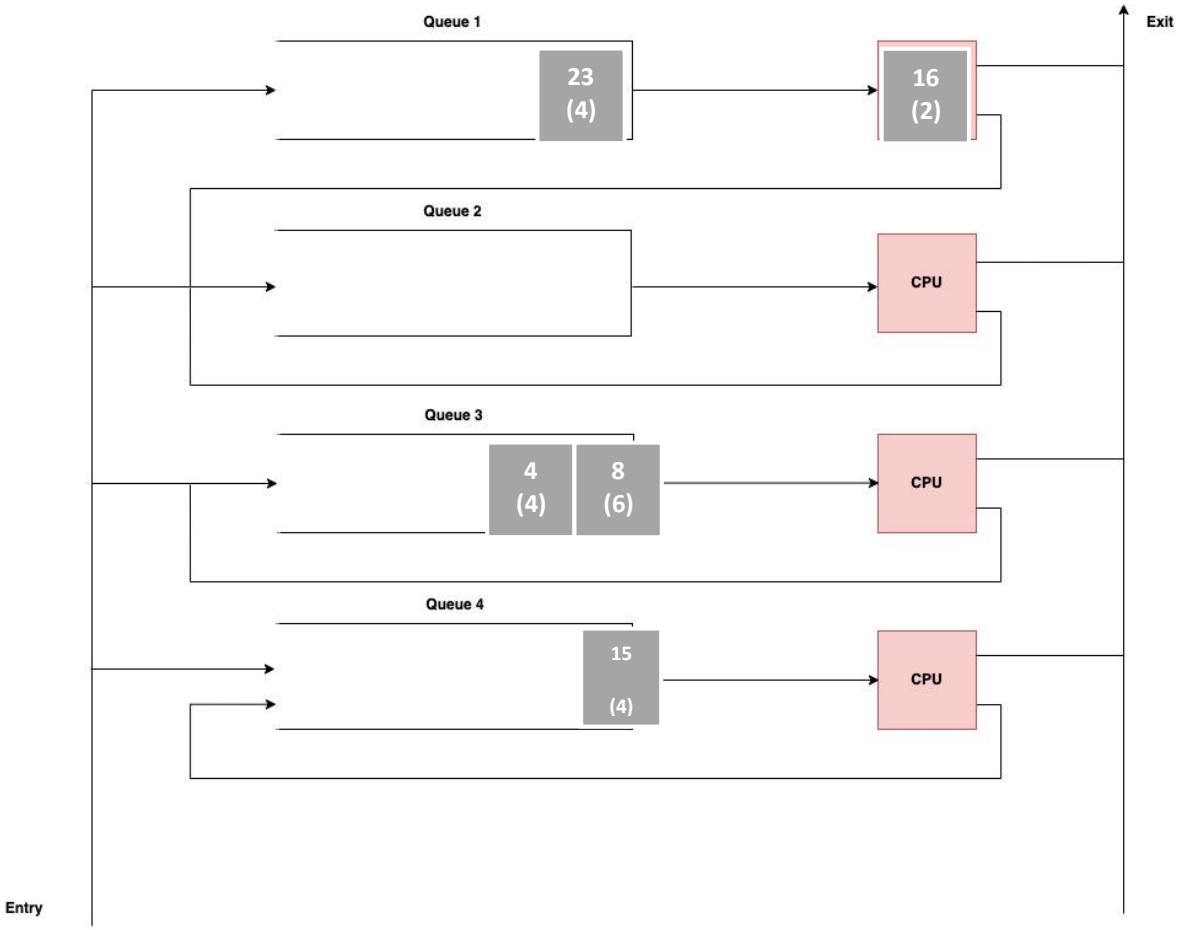
Time = 5

- Process (ID:4) stays in the CPU because it has the shortest remaning time with 5.



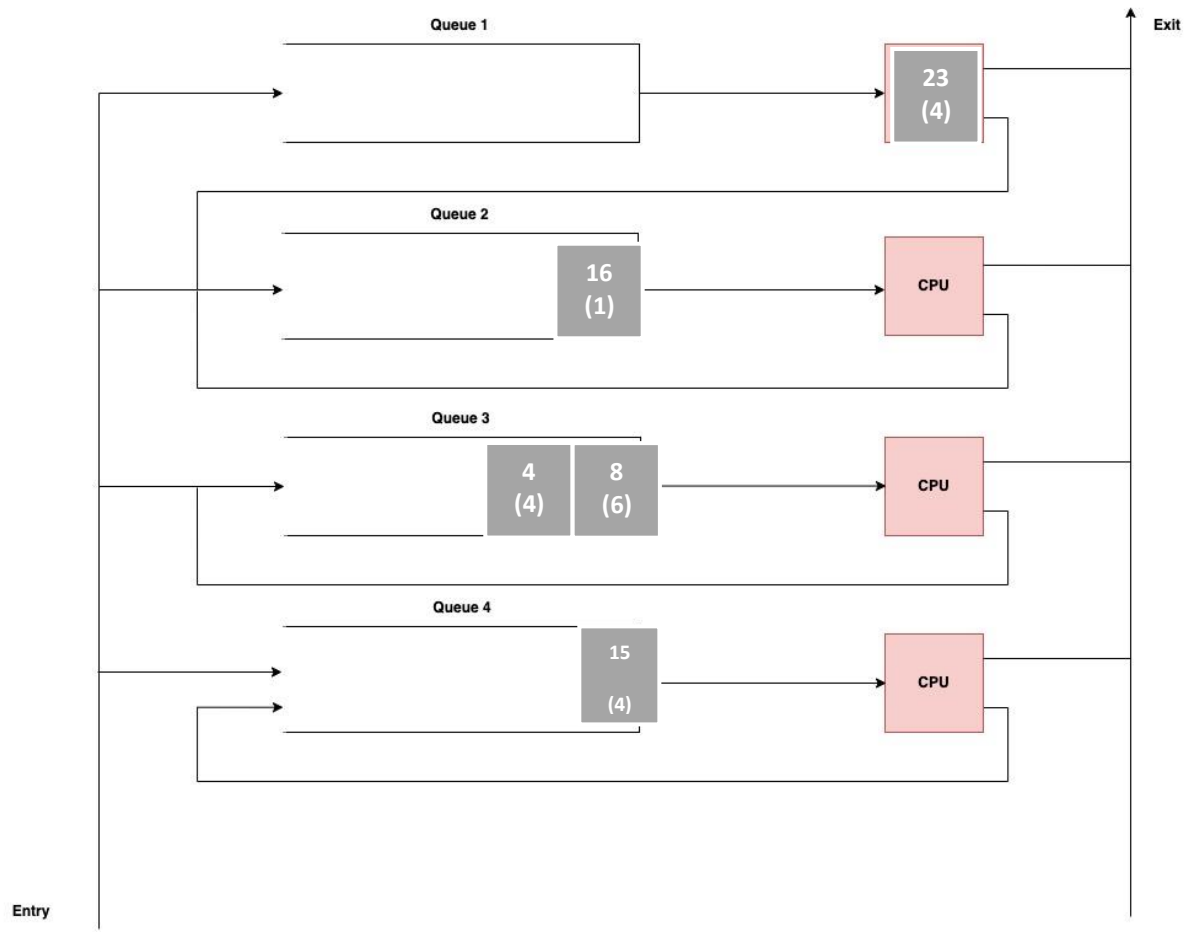
Time = 6

- Process (ID:16) arrived and added to the queue 1. Since it has higher priority, it uses the CPU.
- Process (ID:4) preemptively removed from the CPU to allow execution of 16. Remaining work is 4.



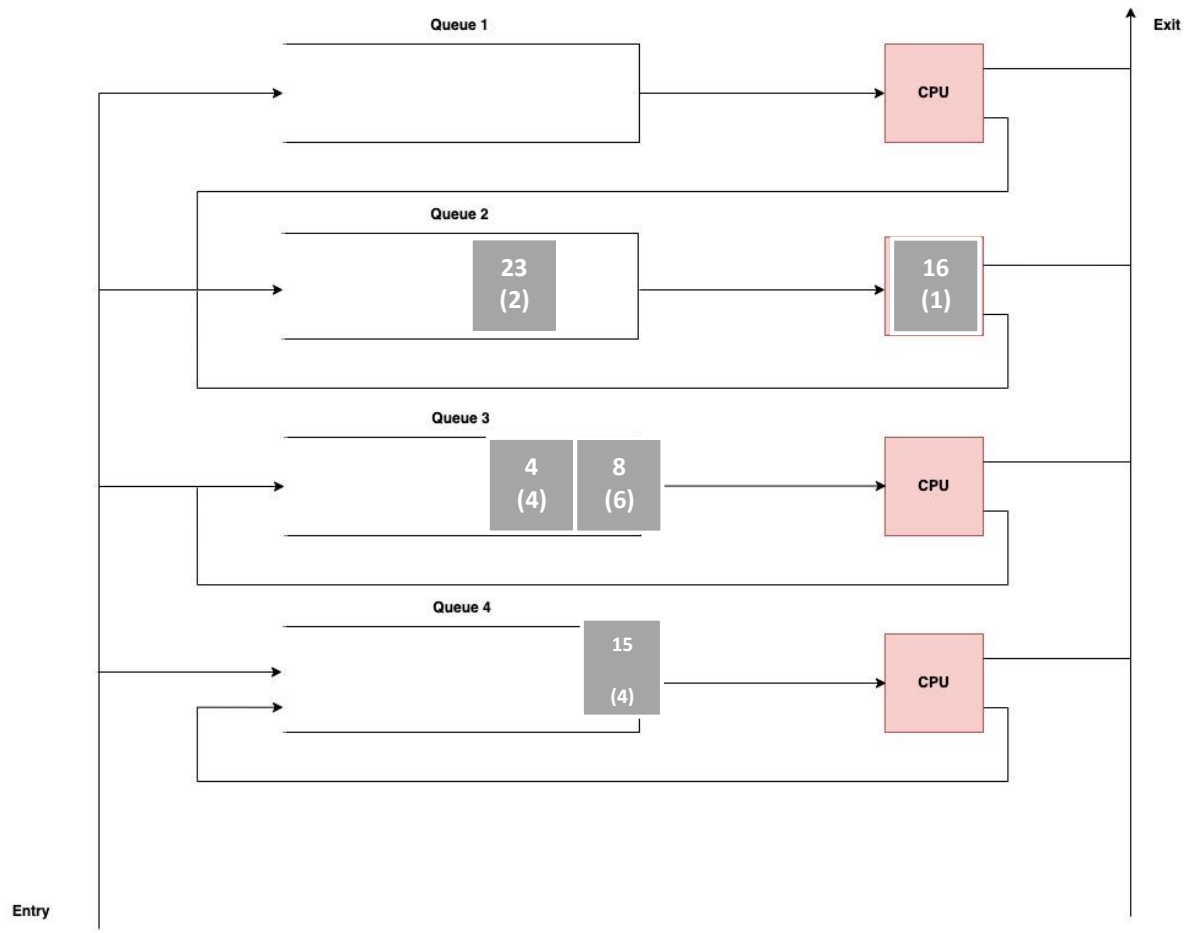
Time = 7

- Process (ID:23) arrived and added to the queue 1.
- Process (ID:16) burst time decreased by 1.



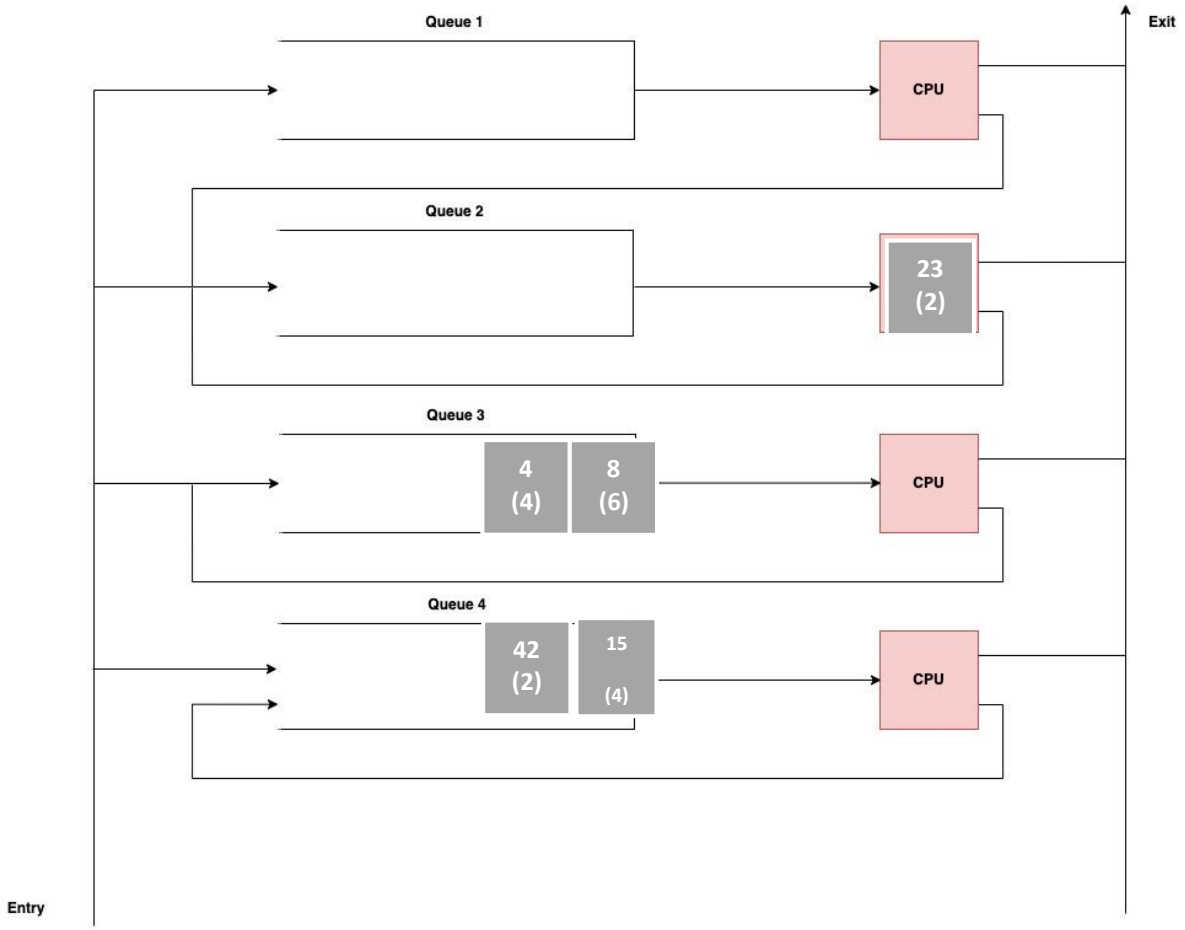
Time = 8

- Process (ID:16) used its allowed quantum and did not finish. It moved to queue 2 with remaining burst time 1.
- Process (ID:23) takes the CPU.



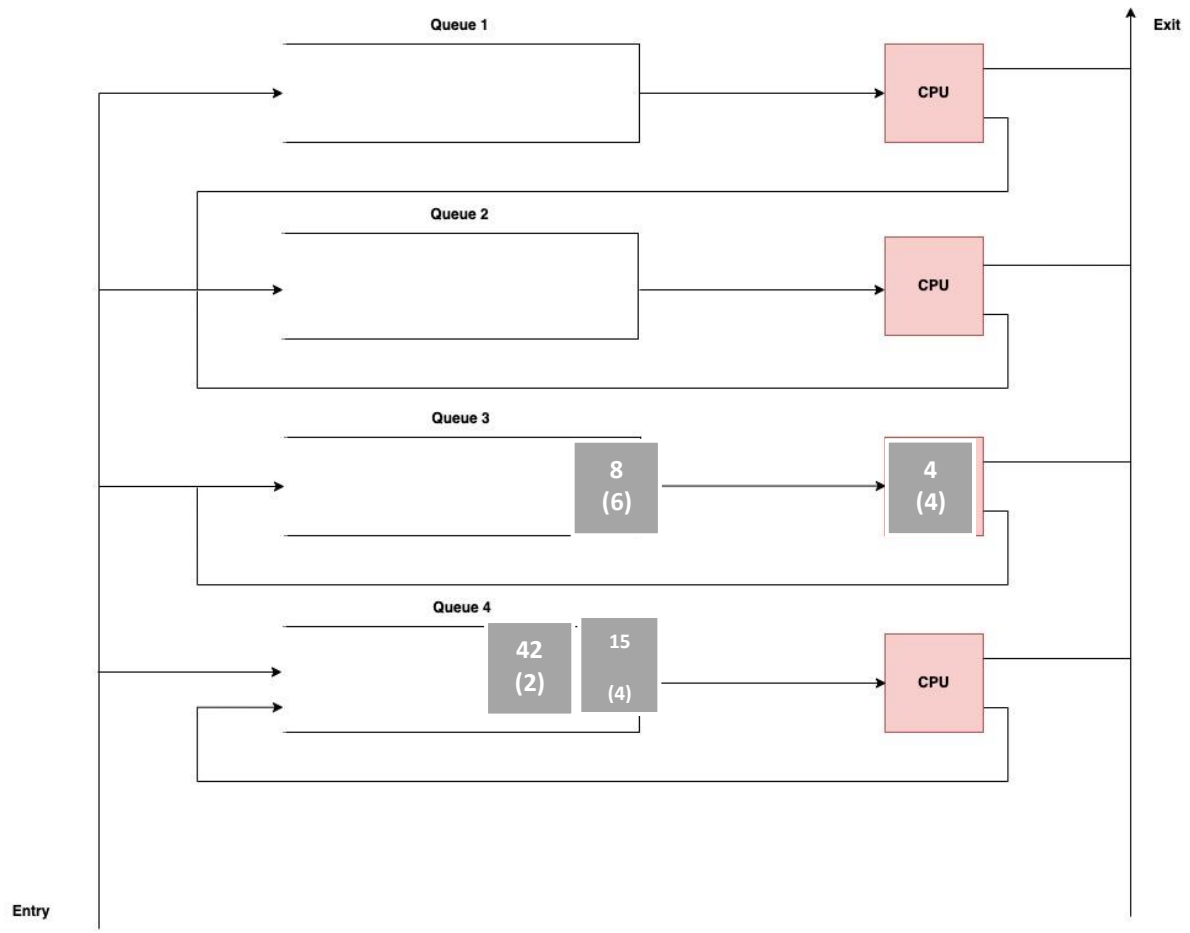
Time = 10

- Process (ID:23) used its allowed quantum and did not finish. It moved to queue 2 with remaining burst time 2.
- Process (ID:16) takes the CPU since it has the initial shortest service time with 3 compared to 4 of 23.



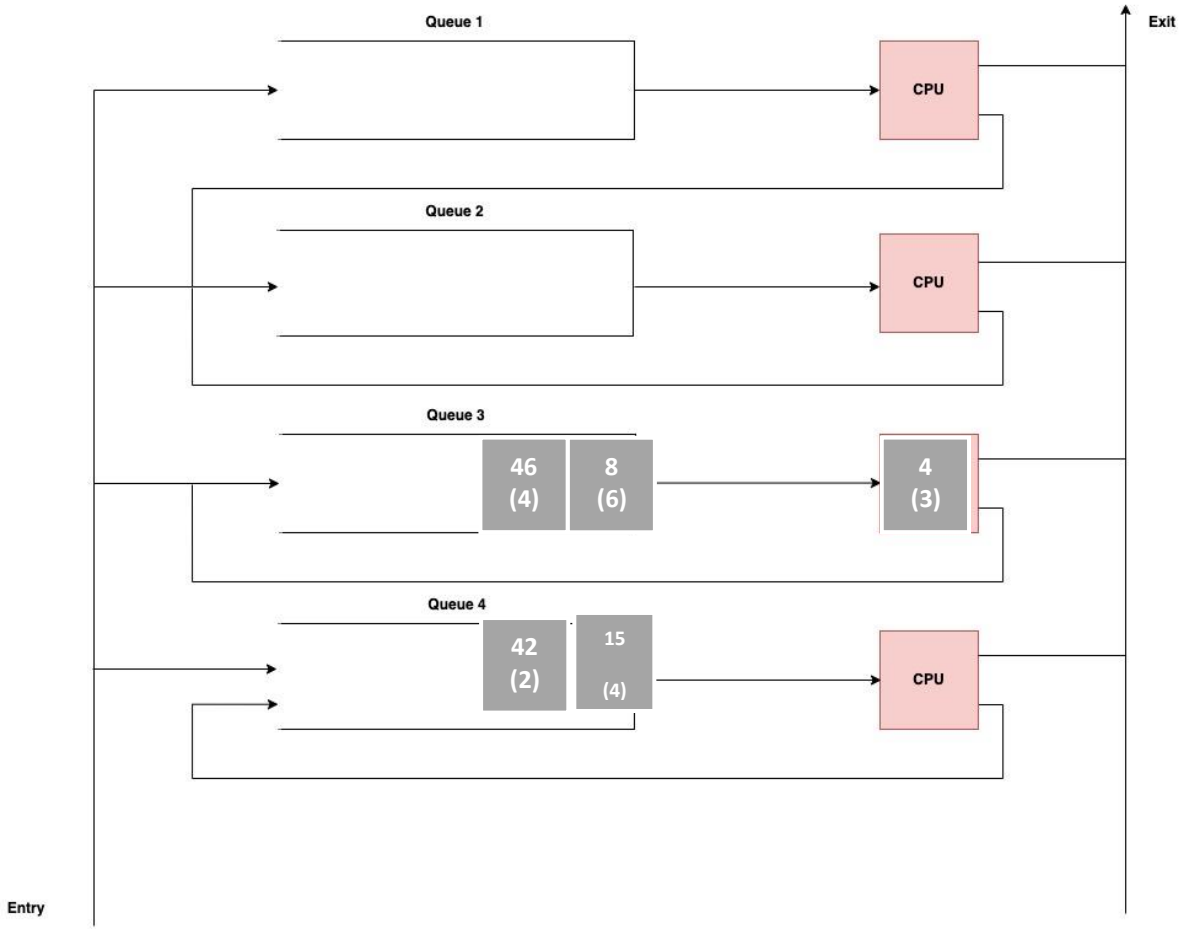
Time = 11

- Process (ID:16) finished execution completely.
- Process (ID:42) arrives at queue 4.
- Process (ID:23) takes the CPU since it has the highest priority.



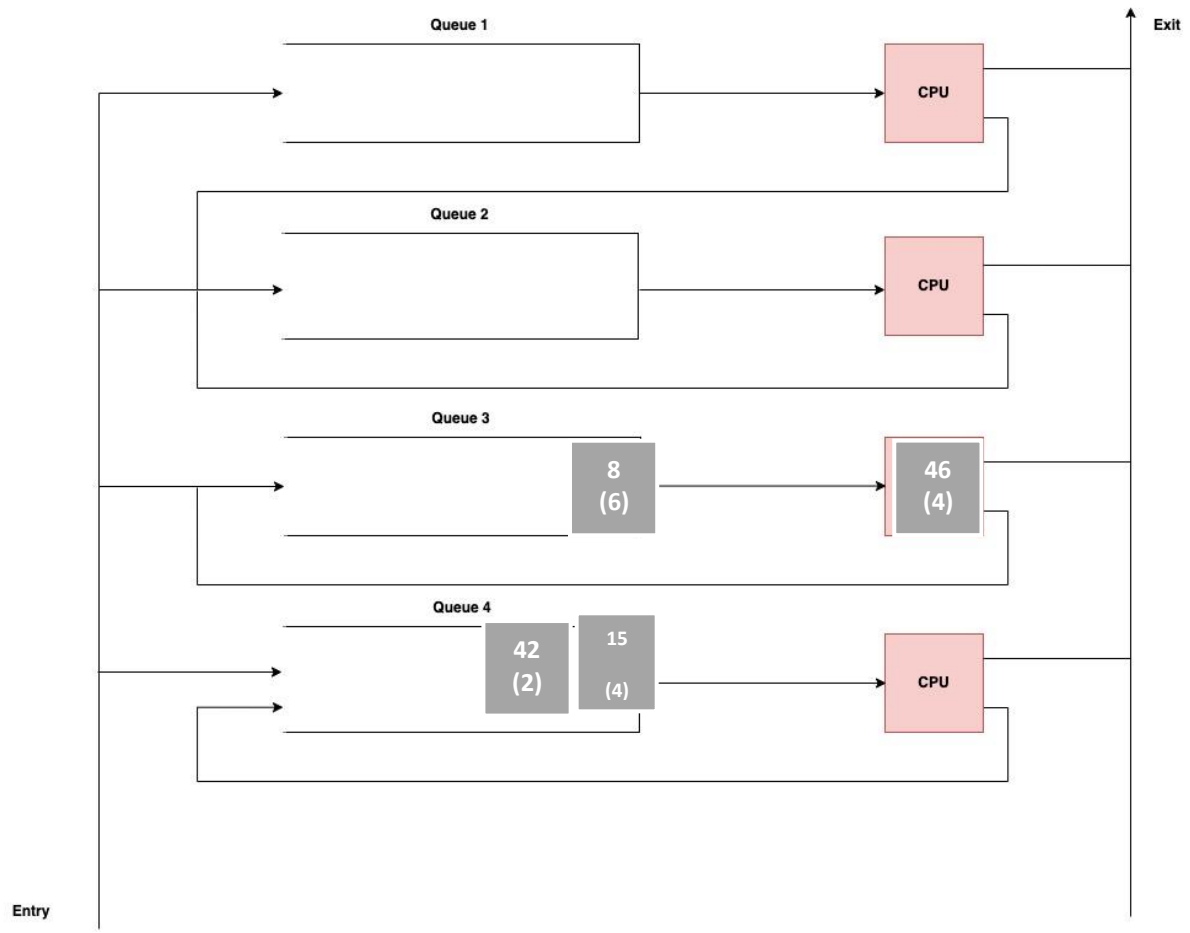
Time = 13

- Process (ID:23) finished execution completely.
- Process (ID:4) takes the CPU since it has the shortest remaining service time.



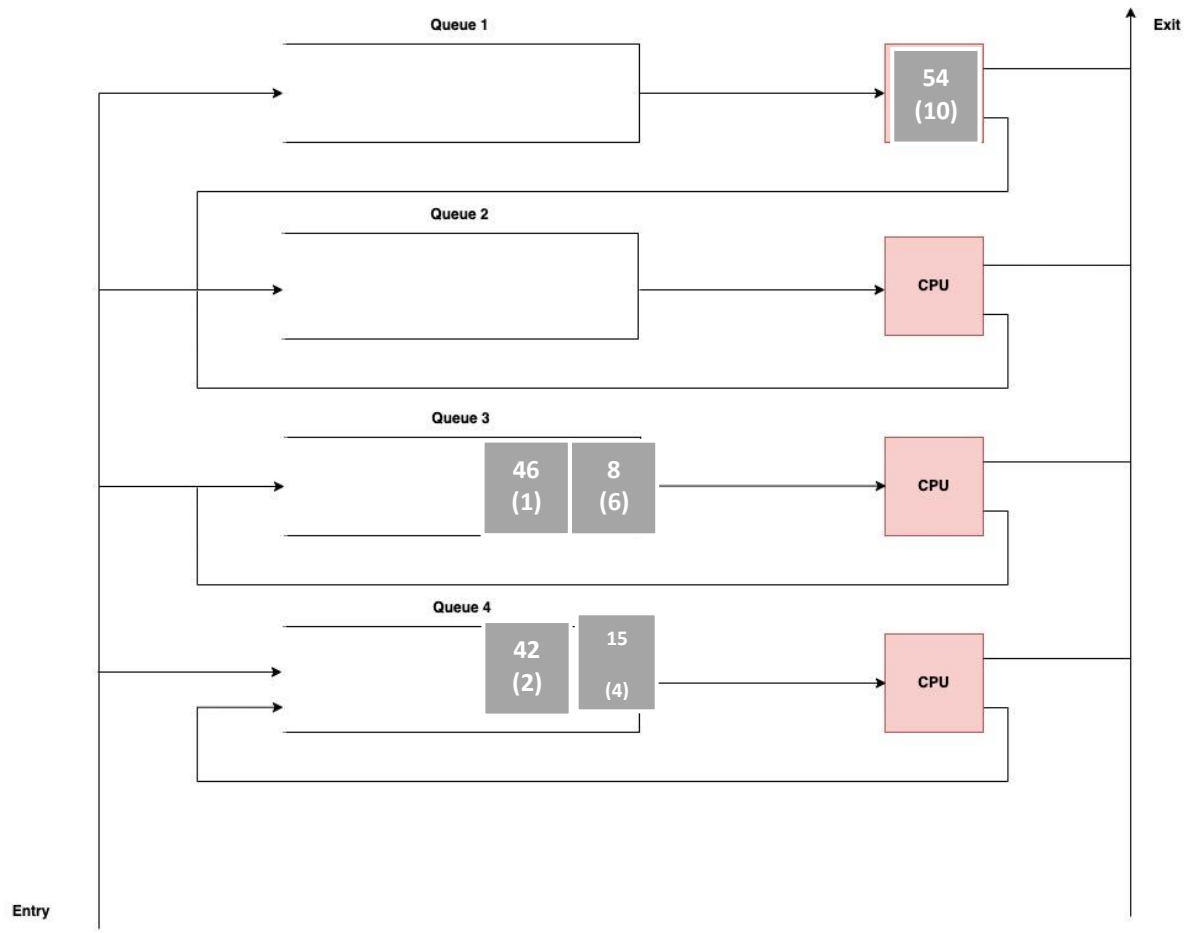
Time = 14

- Process (ID:46) arrives at queue 3.



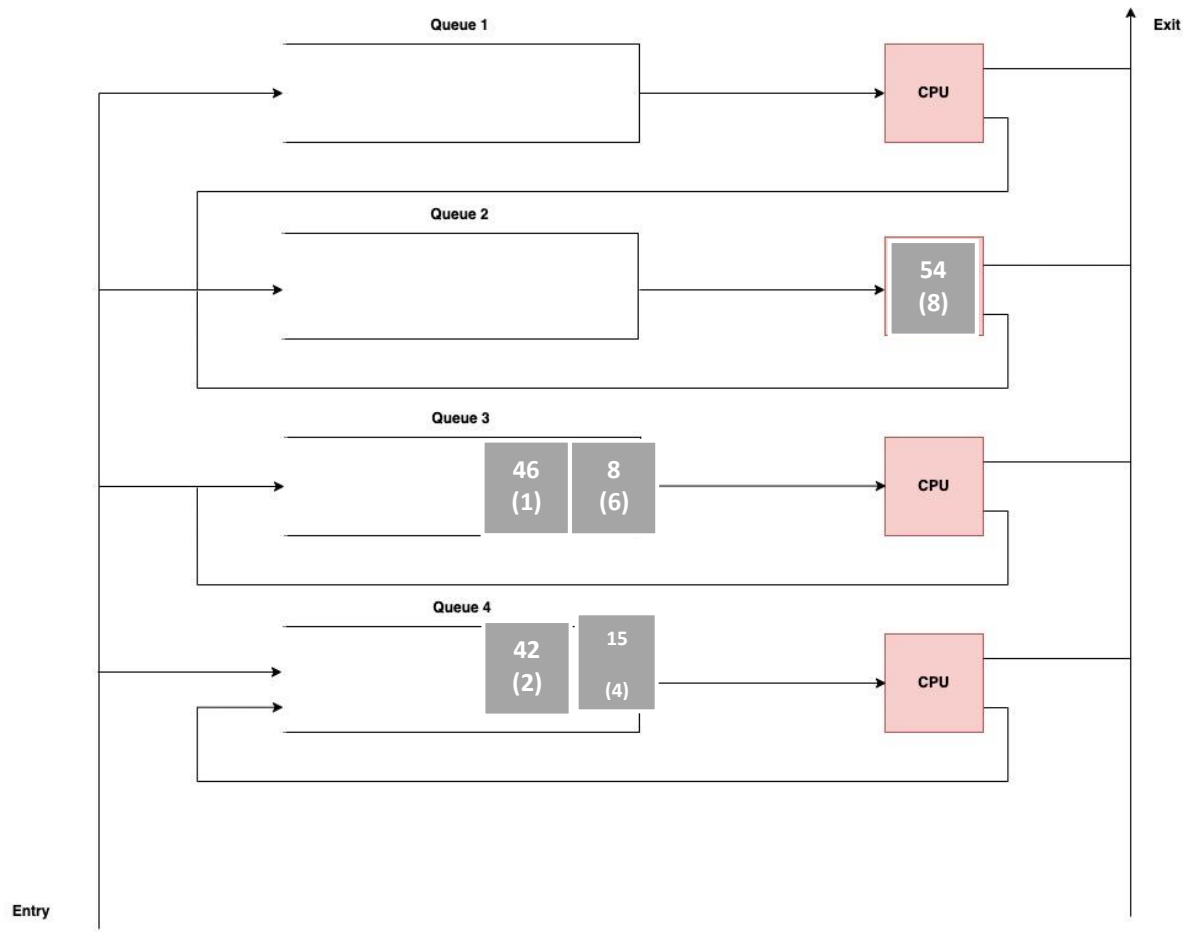
Time = 17

- Process (ID:4) is completed.
- Process (ID:46) starts using CPU.



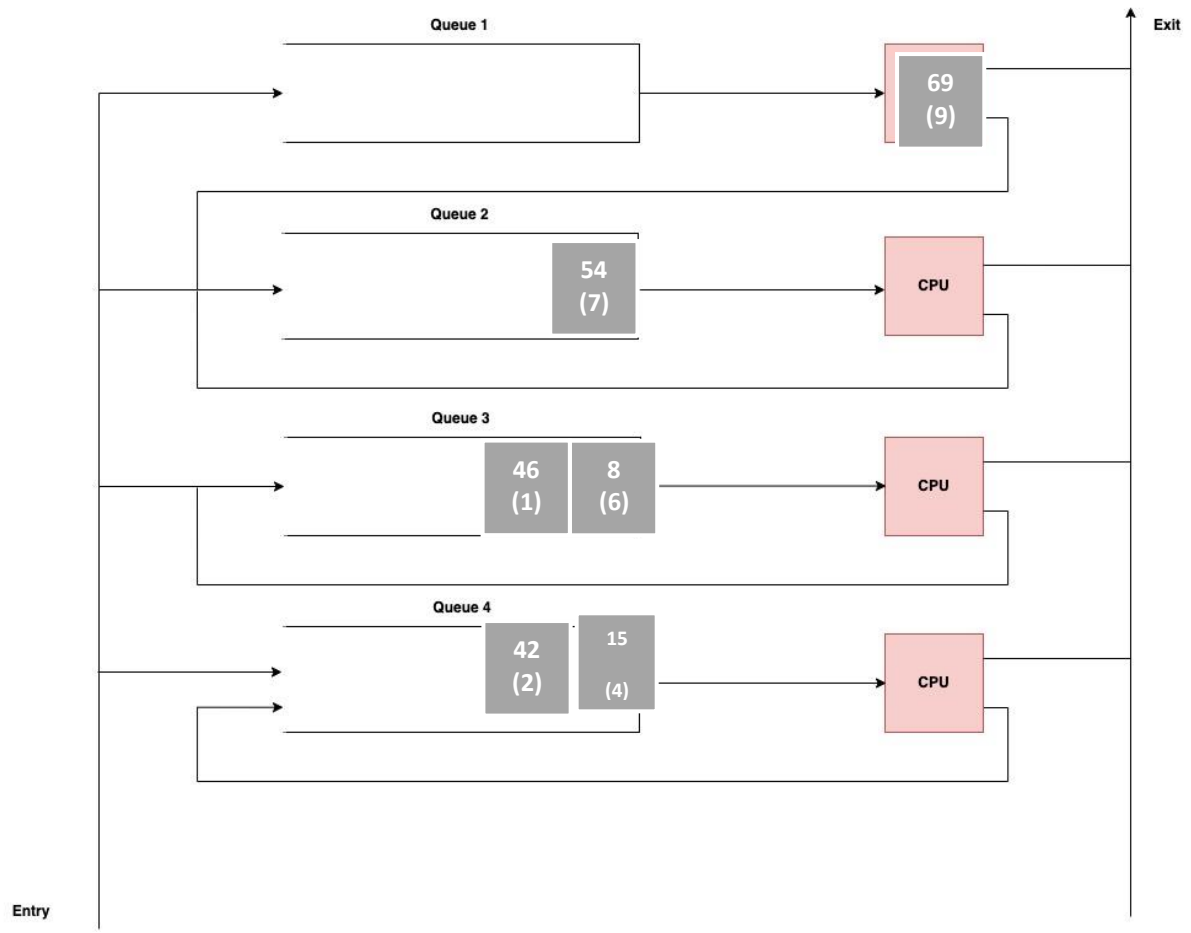
Time = 20

- Process (ID:46) is preemptedly removed from the CPU because of newly arrived process 54. Remaining service time is 1.
- Process (ID: 54) arrived and started using CPU.



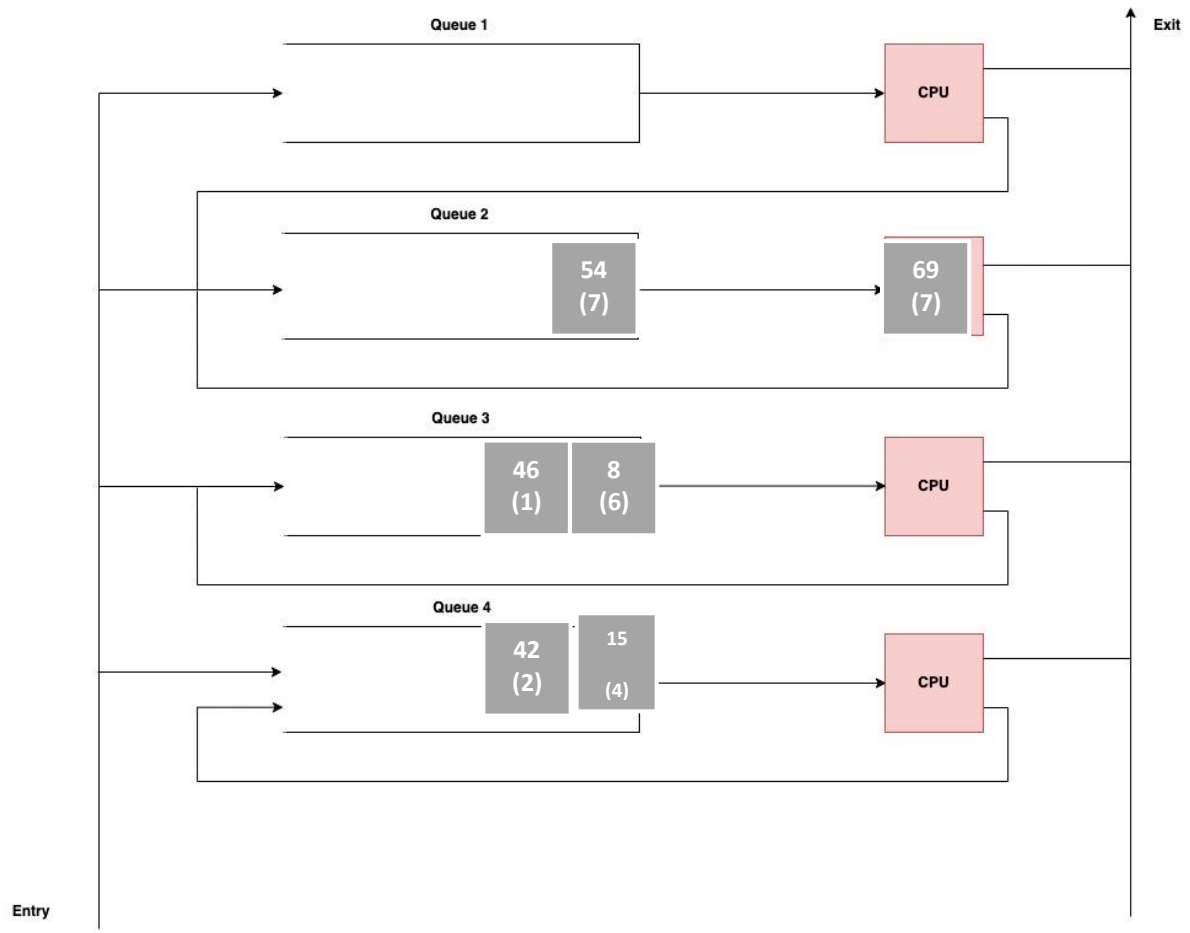
Time = 22

- Process (ID: 54) spent its quantum and moved to Q2 since it did not finish. Remaining time is 8.
- Process (ID: 54) takes CPU again from queue 2.



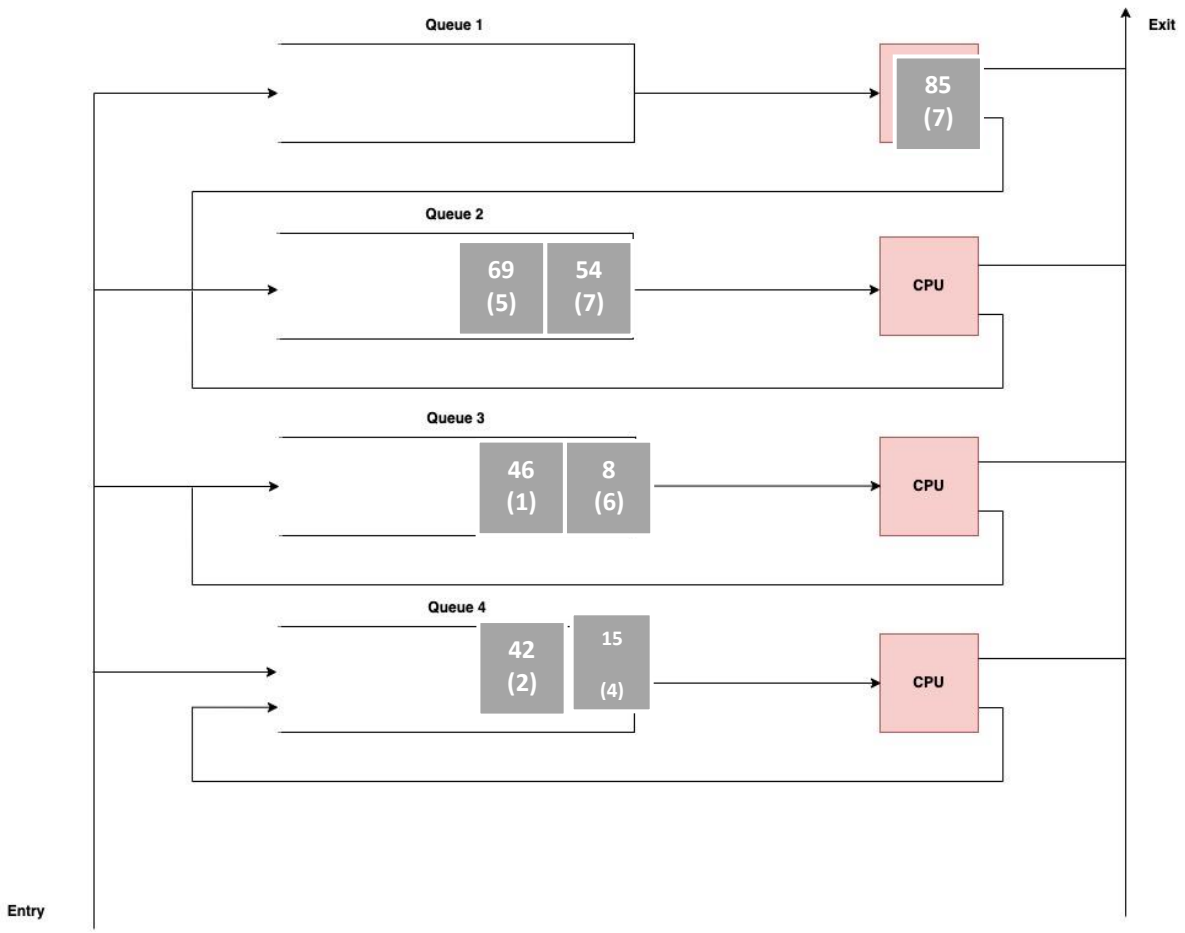
Time = 23

- Process (ID: 54) preemptively removed from the CPU because of higher priority queue 1 received Process (ID: 69). Process (ID: 54) remaining time is 7.
- Process (ID: 69) takes CPU.



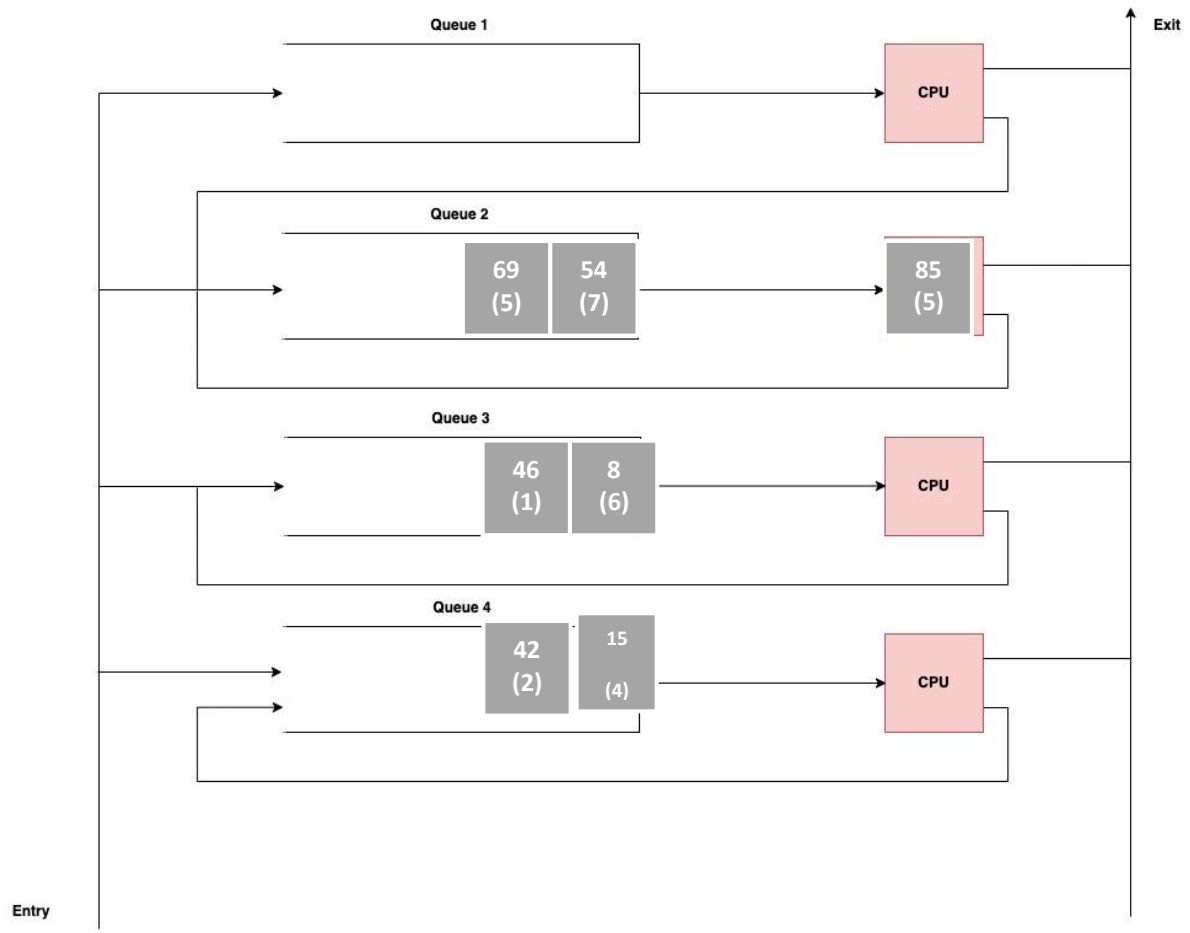
Time = 25

- Process (ID: 69) spent quantum did not finish, moved to queue 2.
- Process (ID: 69) has the shortest initial service time. Process (ID: 69) takes over CPU.



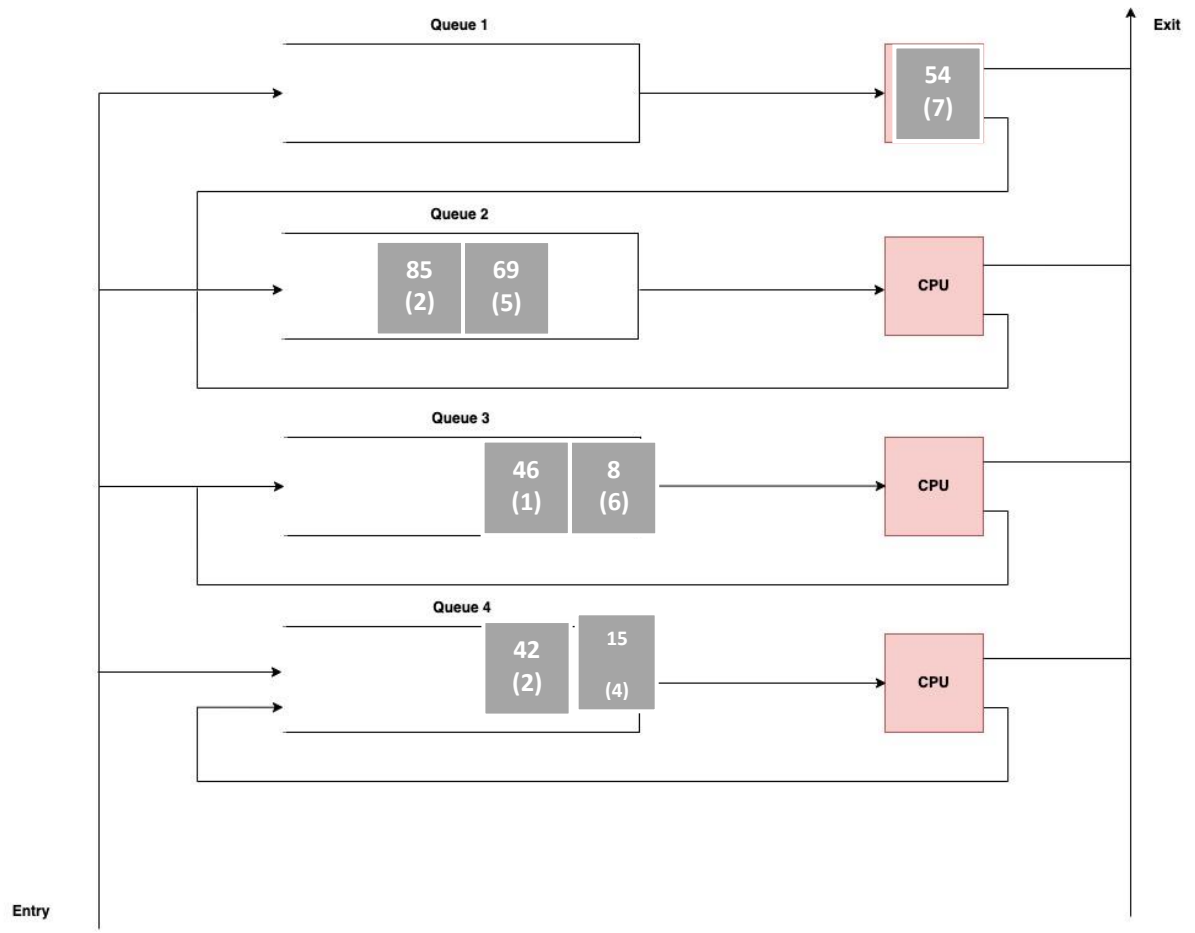
Time = 27

- Process (ID: 69) preemptively removed from the CPU.
- Process (ID: 85) arrives at queue 1. Takes CPU.



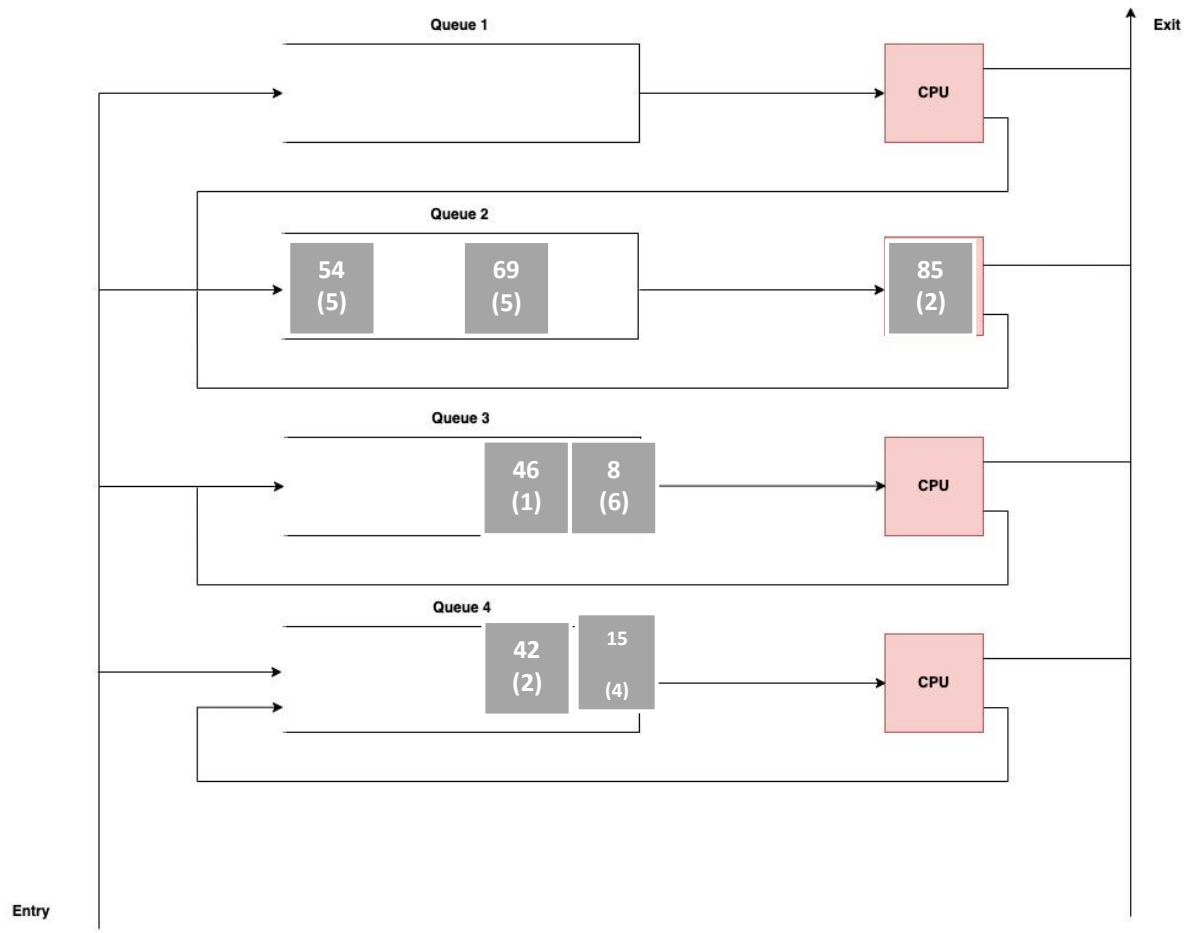
Time = 29

- Process (ID: 85) spent quantum, did not finish, moved to Q2.
- Process (ID: 85) takes CPU. It has shortest initial service time.



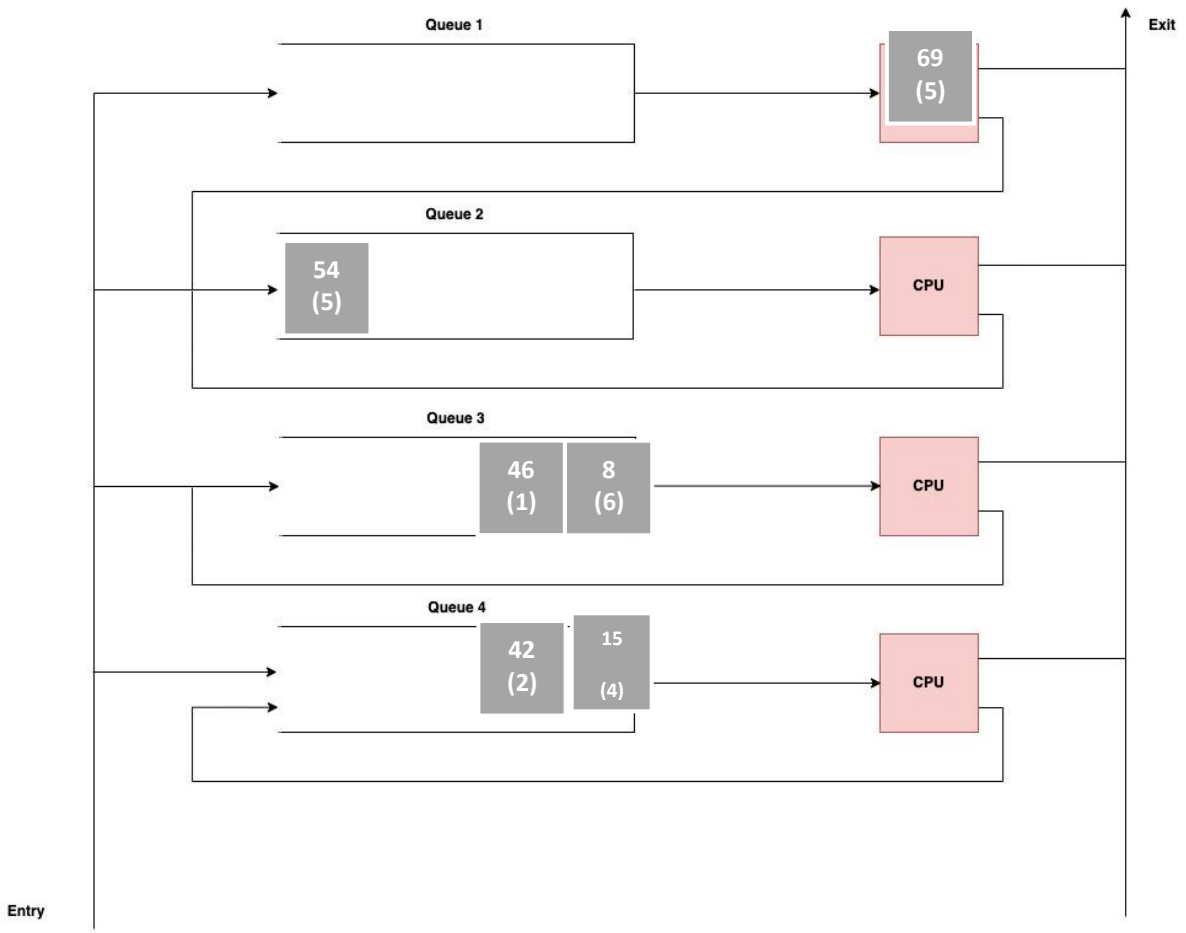
Time = 32

- Process (ID: 85) spent quantum, did not finis. Remaining time is 2.
- At this point, Process (ID: 54) has been waiting for 3Q which is t=9 in queue 2. Because it was preemptively removed from CPU and started waiting at time t = 23 when process 60 arrived.
-
- T = 23 + 3Q(9) => T = 32
-
- Process (ID: 54) moves up to Queue 1. Takes CPU.



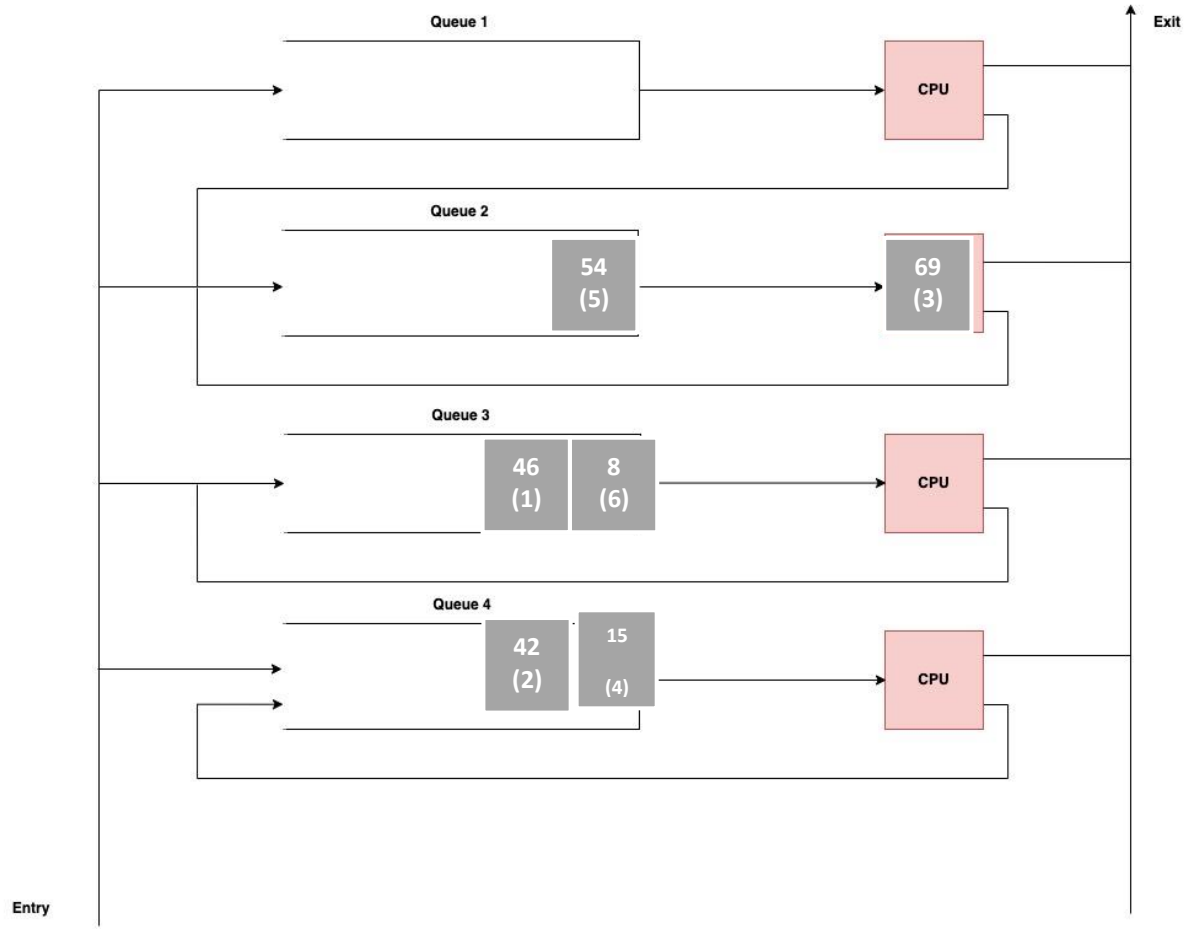
Time = 34

- Process (ID: 54) spent quantum, did not finish. Remaining time is 5. Moved below to queue 2.
-
- Process (ID: 85) takes CPU because it has the shortest intial service time with 7.
-
-



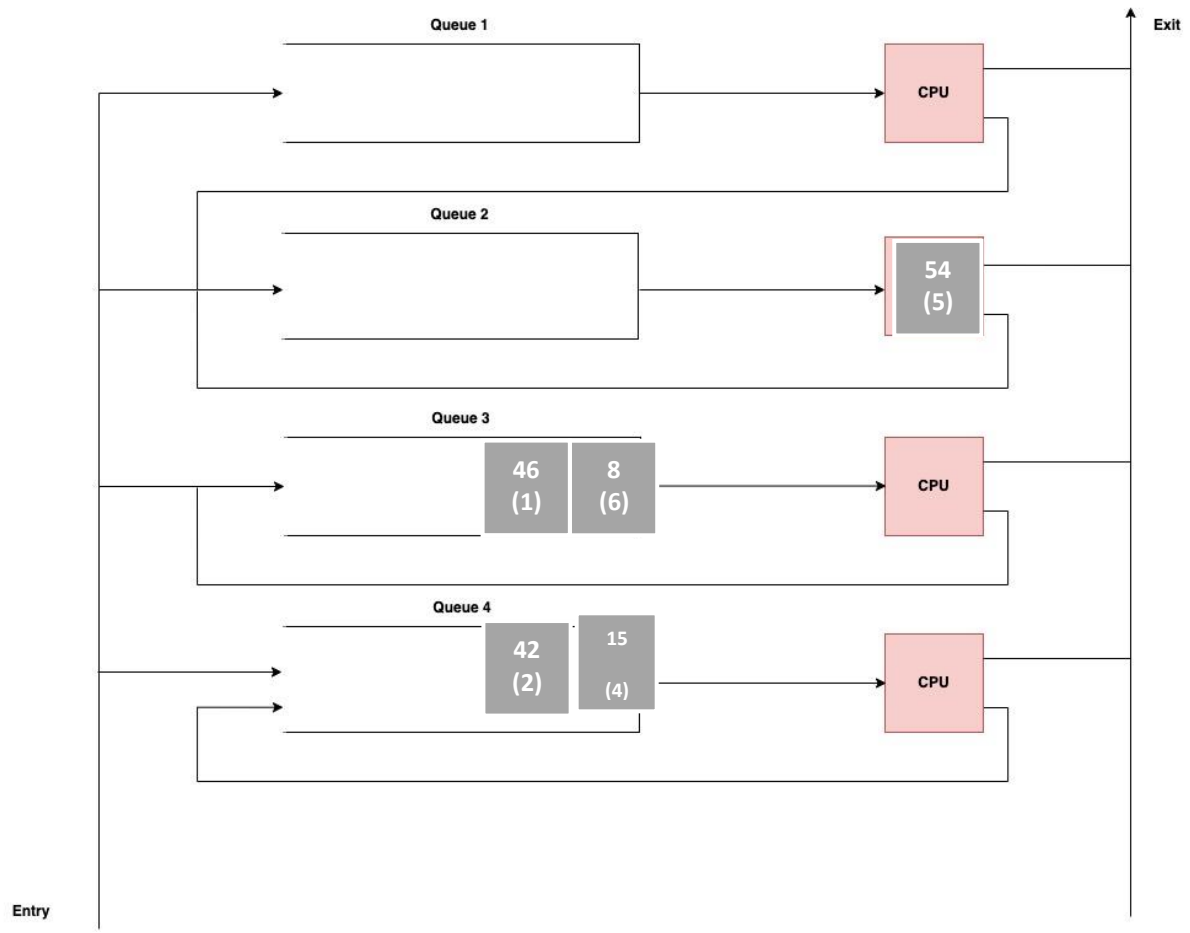
Time = 36

- Process (ID: 85) finished.
-
- At this point, Process (ID: 69) has been waiting for 3Q which is t=9 in queue 2.
- Because it was preemptively removed from CPU and started waiting at time t = 27 when process 85 arrived.
-
- T = 27+ 3Q(9) => T = 36
-
- Process (ID: 69) moves up to Queue 1. Takes CPU.
-



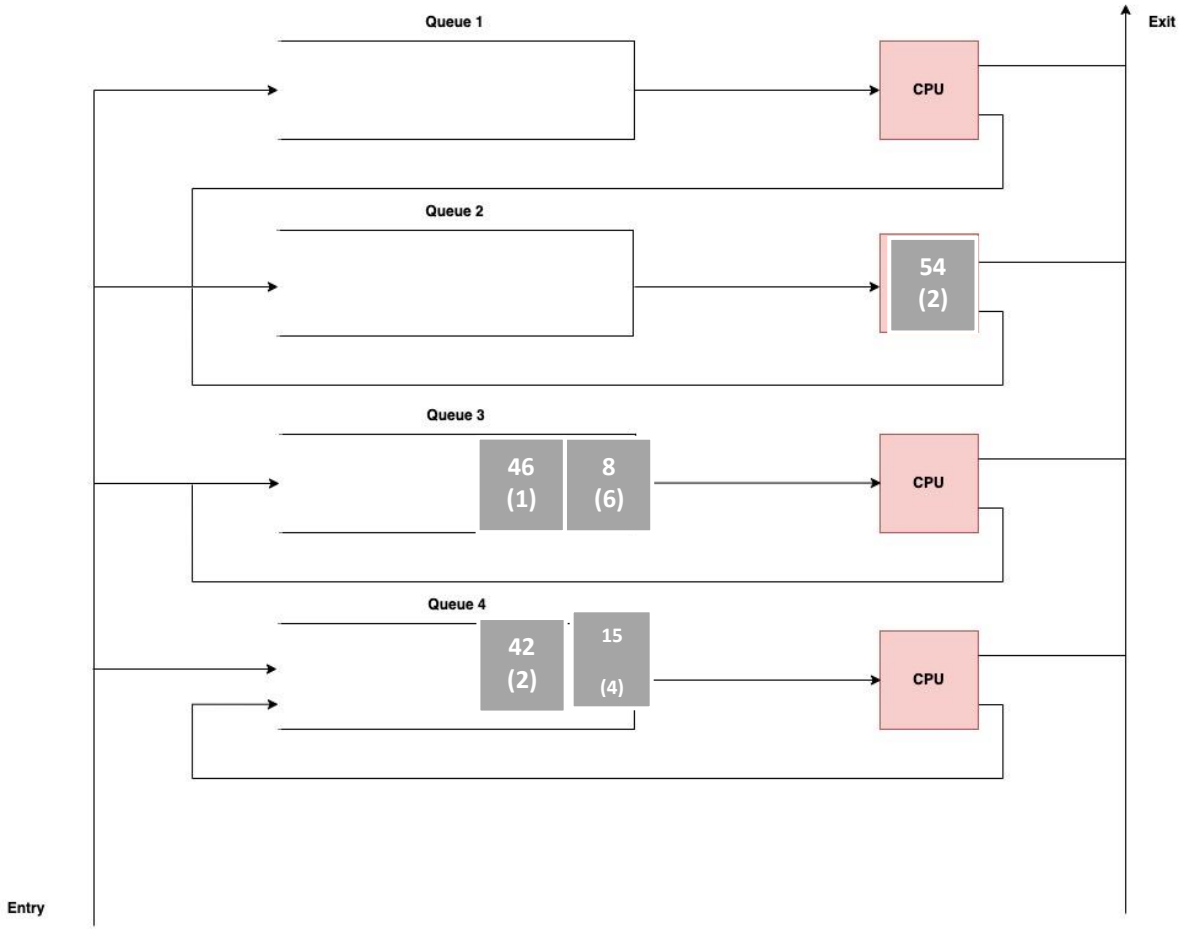
Time = 38

-
- Process (ID: 69) spent quantum, did not finish moved below to Q2.
- Process (ID: 69) takes CPU because of shorter initial service time.
-



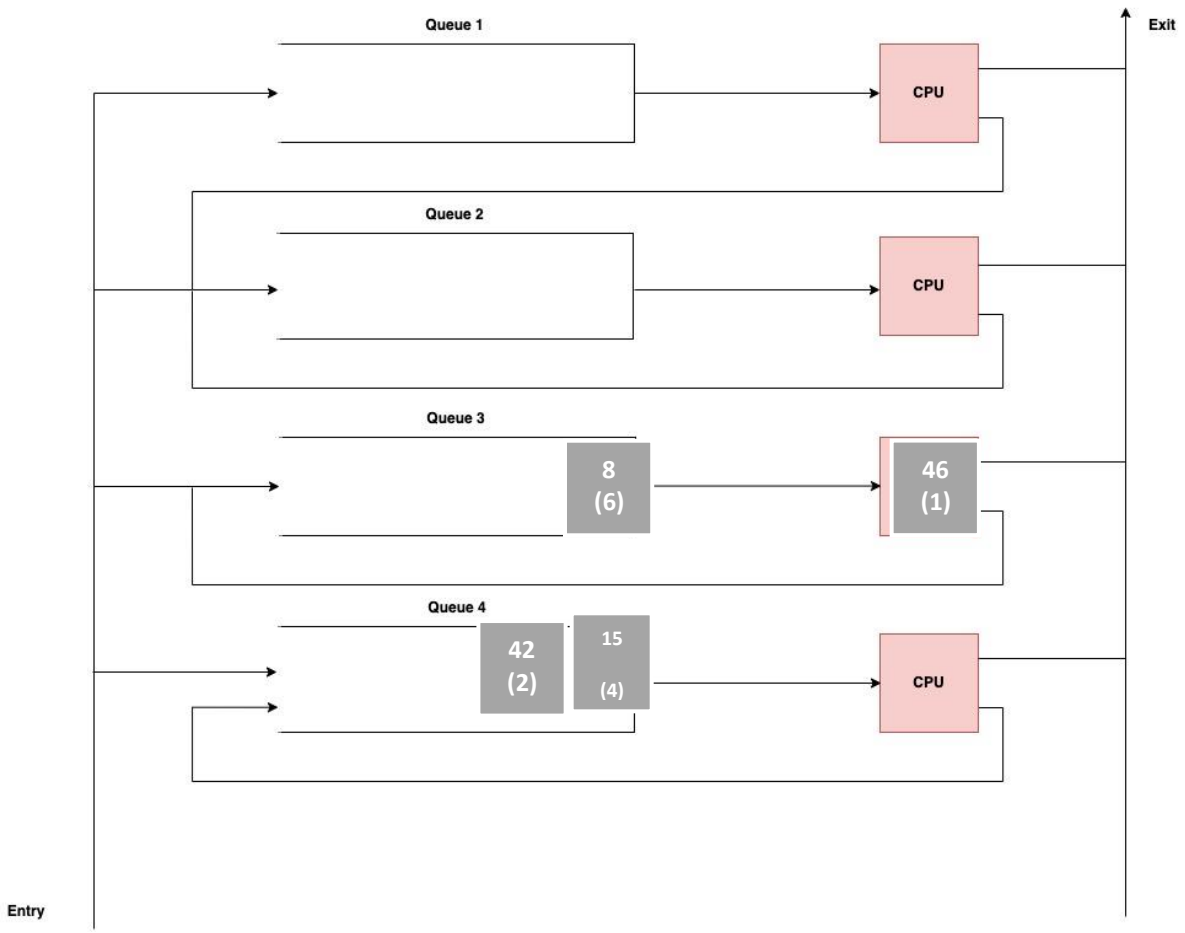
Time = 41

-
- Process (ID: 69) spent quantum, finished execution.
- Process (ID: 54) takes CPU.
-



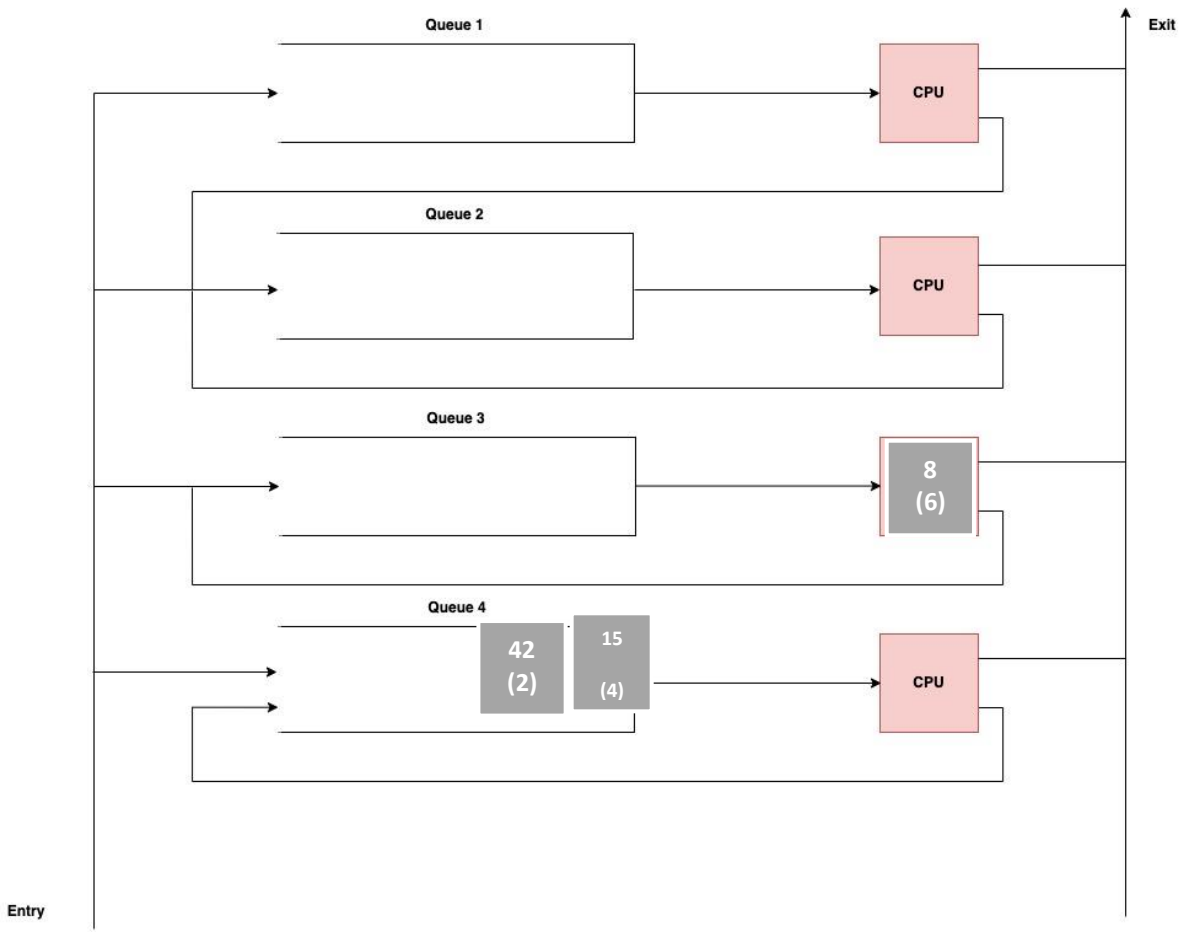
Time = 44

-
- Process (ID: 54) spent quantum, did not finish execution, it will continue using CPU.
-



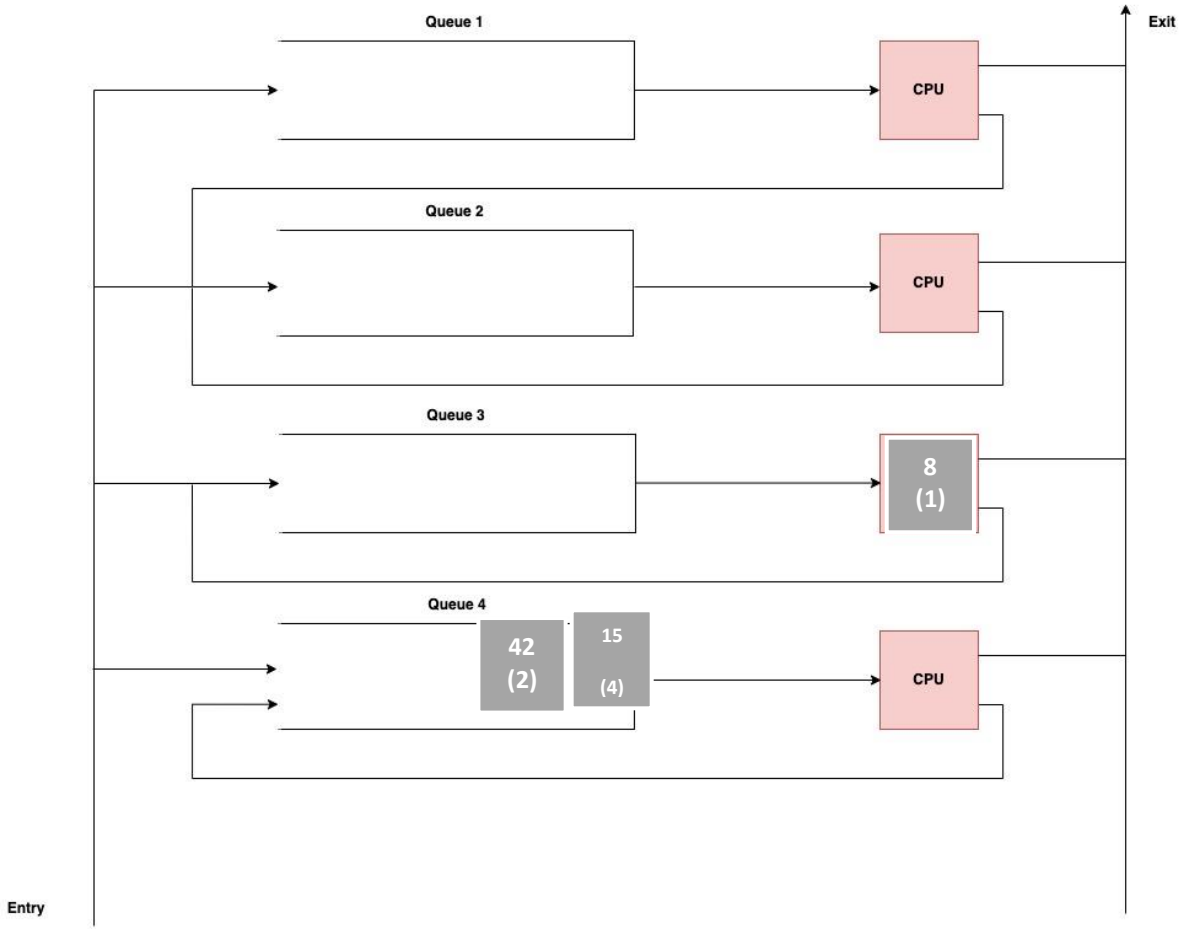
Time = 46

-
- Process (ID: 54) spent quantum, finished execution.
- Process (ID: 46) takes CPU.
-



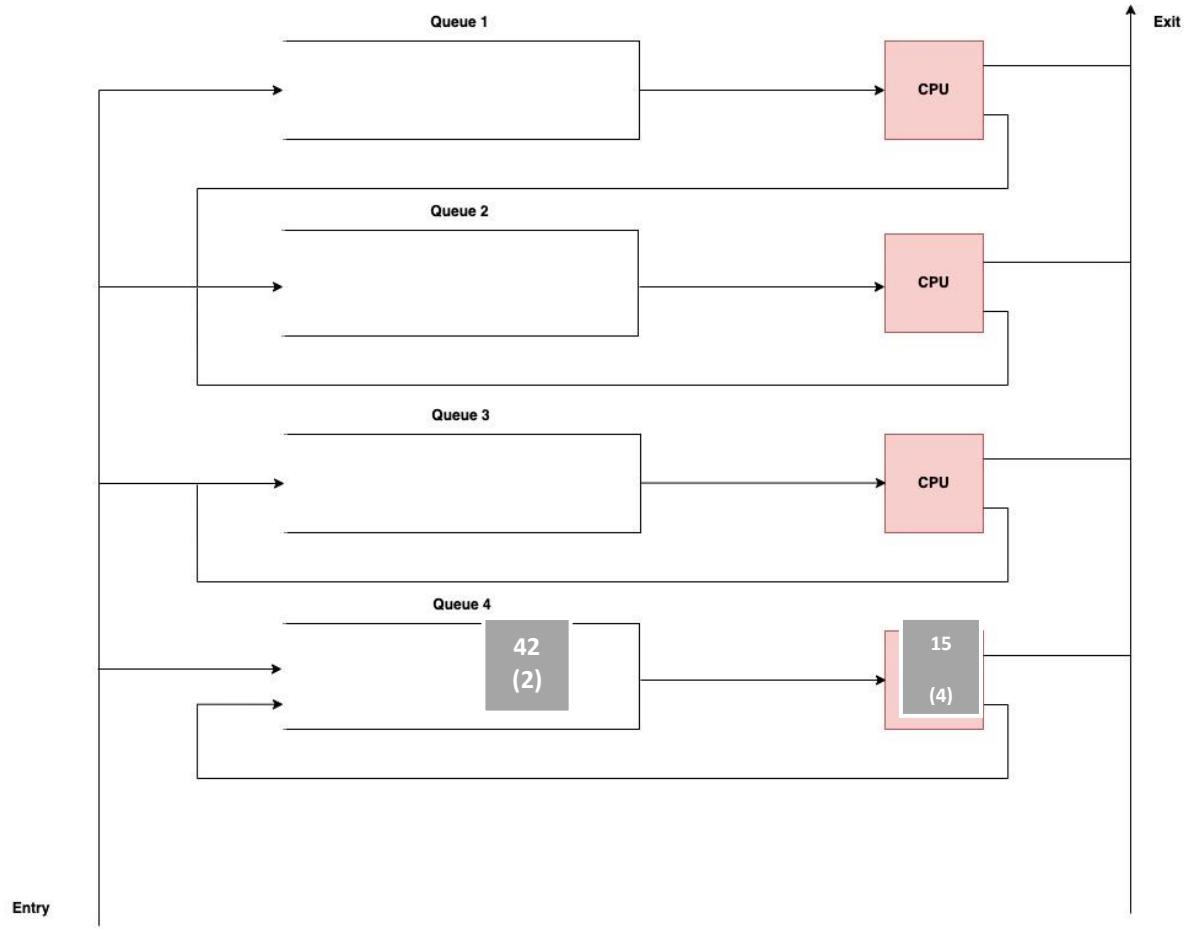
Time = 47

-
- Process (ID: 46) finished execution.
- Process (ID: 8) takes CPU
-



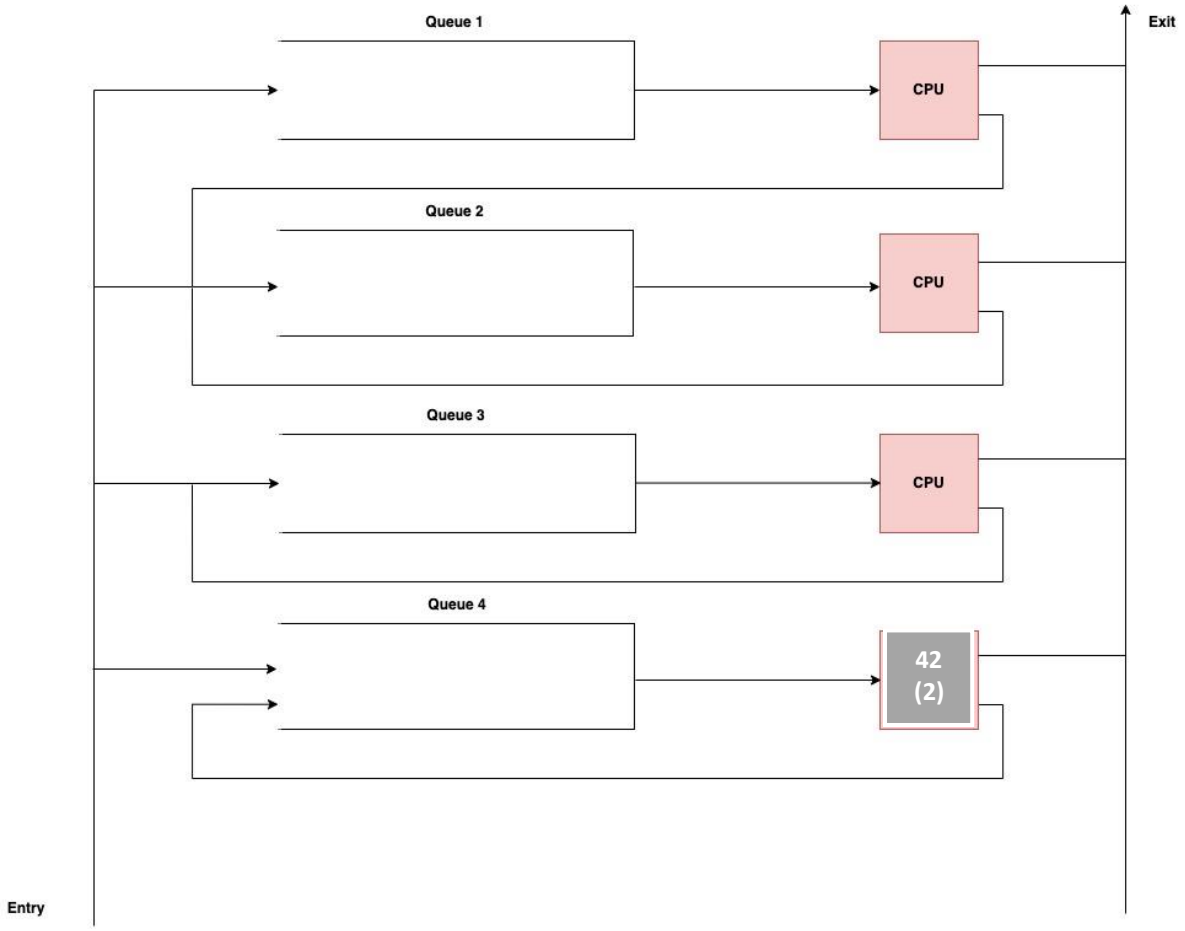
Time = 52

-
- Process (ID: 46) finished quantum, remaining time is 1, continues using CPU
-



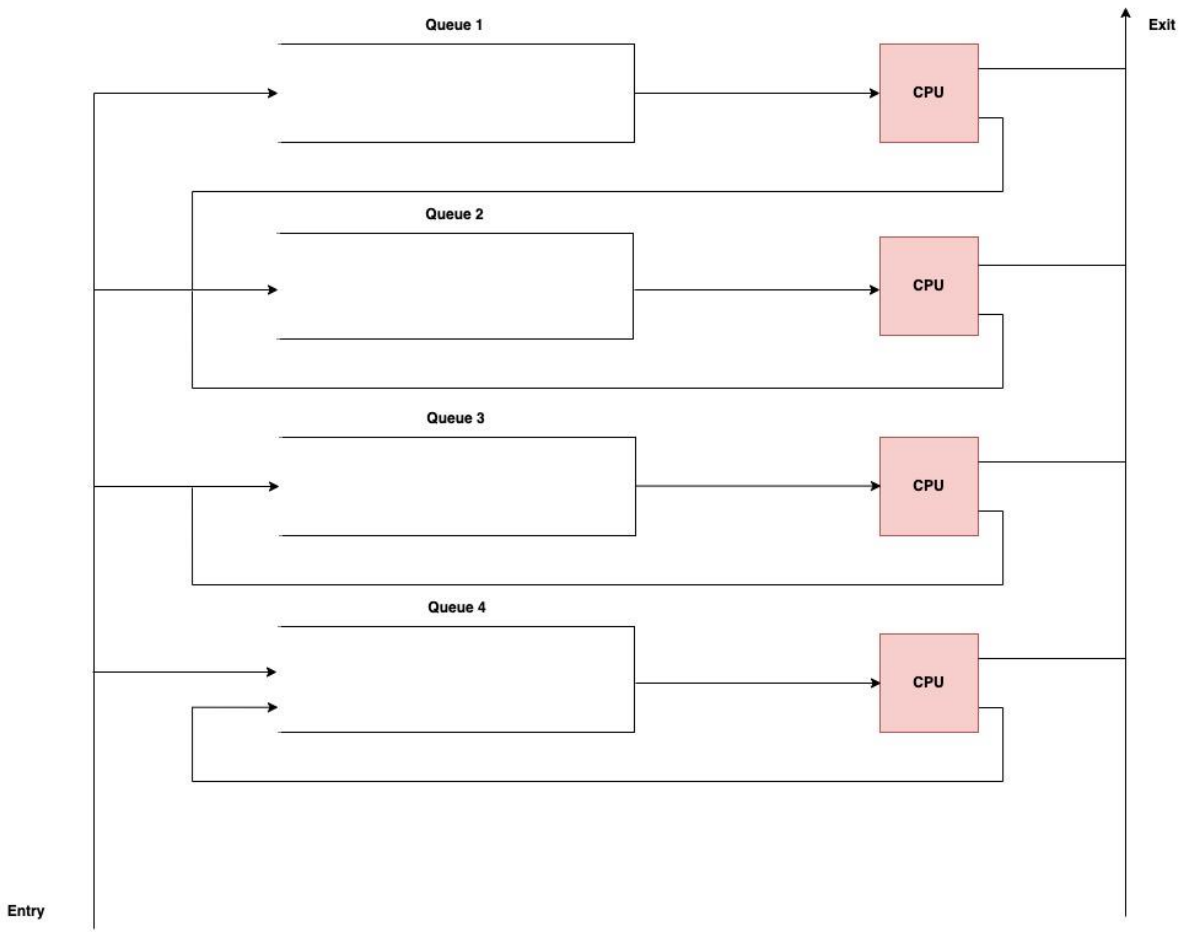
Time = 53

-
- Process (ID: 8) finished execution.
- Process (ID: 15) takes CPU.
-



Time = 57

-
- Process (ID: 15) finished execution.



Time = 59

-
- Process (ID: 42) finished execution.

PROCESS CHART