Operating Systems
Project 9

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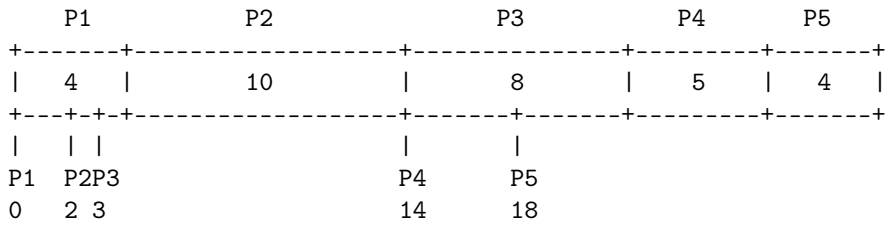
1. Residence time is $r_i = f_i - a_i$, where a_i is arrival time and f_i is finish time of the process, waiting time is $w_i = r_i - d_i$, where d_i is the service time. We note that $\widetilde{W} = \frac{1}{n} \cdot \sum_{i=1}^{n} w_i = \widetilde{R} - \frac{1}{n} \cdot \sum_{i=1}^{n} d_i$, where $\widetilde{R} = \frac{1}{n} \sum_{i=1}^{n} r_i$, and

$$\frac{1}{n} \cdot \sum_{i=1}^{n} d_i = \frac{1}{5}(4 + 10 + 8 + 5 + 4) = 6.2,$$

and

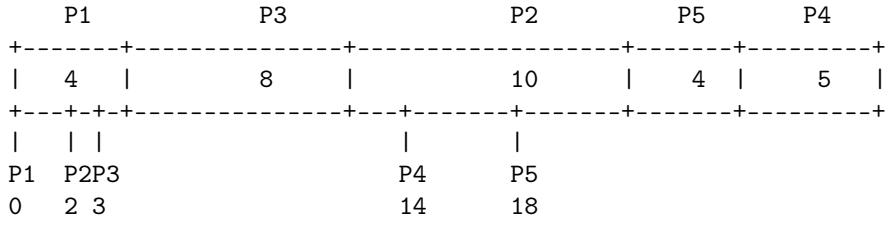
$$\widetilde{R} = \frac{1}{n} \sum_{i=1}^{n} f_i - a_i = \frac{1}{n} \sum_{i=1}^{n} f_i - \frac{1}{n} \sum_{i=1}^{n} a_i = \frac{1}{n} \sum_{i=1}^{n} f_i - 7.4$$

   (a) FCFS:



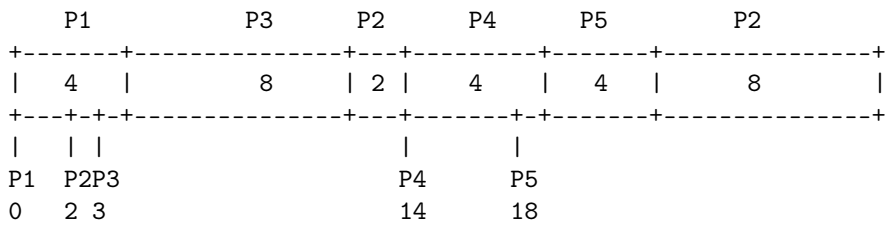
   Order would be P_1, P_2, P_3, P_4, P_5, Average residence time is $19.6 - 7.4 = 12.2$ and Average waiting time is $12.2 - 6.2 = 6$

   (b) SJF:



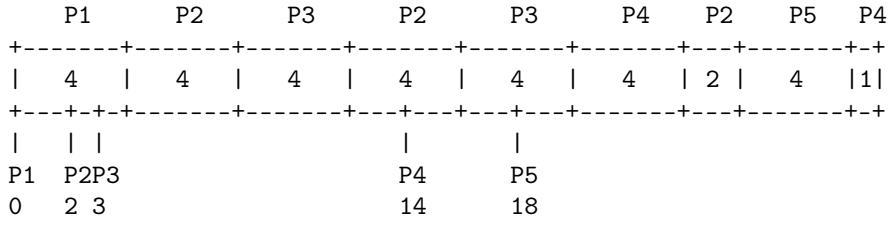
   Order would be P_1, P_3, P_2, P_5, P_4, Average residence time is $19 - 7.4 = 11.6$ and Average waiting time is 5.4.

   (c) SRTF:



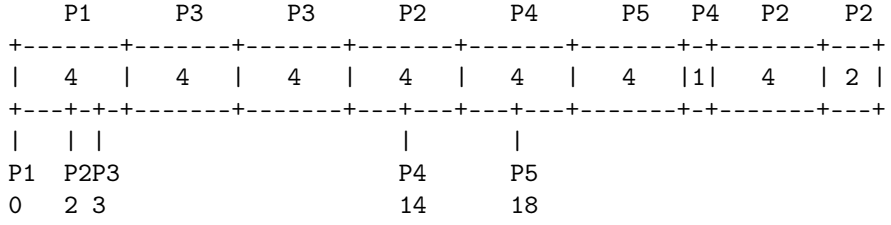
Order would be $P_1, P_4, P_2, P_5, P_4, P_2$, Avg. residence time is $17.8 - 7.4 = 10.4$ and Avg. waiting time is $10.4 - 6.2 = 4.2$.

(d) RR:



Order would be $P_1, P_2, P_3, P_2, P_3, P_4, P_2, P_5, P_4$, Avg. residence time is $22.2 - 7.4 = 14.8$ and Avg. waiting time is $14.8 - 6.2 = 8.6$.

(e) RR_{prio}:



Order would be $P_1, P_3, P_3, P_2, P_4, P_5, P_4, P_2, P_2$, Avg. residence time is $19.2 - 7.4 = 11.8$ and Avg. waiting time is $11.8 - 6.2 = 5.6$.

2. As processes are created by running processes, and there is only one process running at each time, there can only one process be created at each time. Thus, only once process can arrive at a time, and not two at the same time.