

Notes:

1. Instead of element value in red-black tree, processes were used, and they were compared by vruntime of processes.
2. Test.txt file is attached with 20 processes, compile them in one folder.
3. Please type 0 to get output from file input
4. Please type 1 to get output from randomly generated input
5. Example output from randomly generated output

PROCESS #	WAIT	RESPONSE TIME	PREEMPTION
1	1371	12	35
2	853	13	26
3	452	12	20
4	1299	12	40
5	1025	12	43
6	517	11	23
7	1027	15	25
8	1331	22	42
9	698	9	38
10	79	2	2
11	1290	12	45
12	1329	12	42
13	335	0	18
14	1430	19	32
15	1222	11	44
16	1367	0	23
17	808	12	34
18	866	12	35
19	1322	9	48
20	426	4	21
21	15	15	0
22	1028	13	43
23	479	2	20
24	722	11	13
25	1183	13	27
26	266	13	9

TOTAL RUNTIME = 1491

AVG: WAIT = 874.615, RESPONSE TIME = 10.6923, PREEMPTION = 28.7692

6. Example output from file input

PROCESS #	WAIT	RESPONSE TIME	PREEMPTION
1	50	10	2
2	49	4	2
3	58	5	2
4	28	6	1
5	121	0	8
6	63	3	2
7	80	4	3
8	32	8	2
9	52	10	1
10	93	9	4
11	124	12	5
12	40	9	3
13	87	10	3
14	101	10	9
15	75	11	4
16	128	11	7
17	11	11	0
18	72	12	2
19	29	13	2
20	47	12	2

TOTAL RUNTIME = 142

AVG: WAIT = 67, RESPONSE TIME = 8.5, PREEMPTION = 3.2

7. If you want to see only average output without detailed processes in each CPU time, please put comments on line 354, 355, 360, 368, 383, 392.
8. Type `g++ -o main main.cpp` to compile
9. `./main` to run the code
10. Sources inspired for red-black tree:
 - a. <https://www.cs.usfca.edu/~galles/visualization/RedBlack.html>
 - b. <https://www.codesdope.com/course/data-structures-red-black-trees/>