



DEPARTMENT OF
SOFTWARE TECHNOLOGY

CSOPESY

Project 1 – CPU Scheduling

Major Details

Groupings:	At most 2 members in a group
Deadline:	May 16, 2022 (Monday) 12:00 NN
Percentage:	15%
Submission guidelines:	Submit the zip file to AnimoSpace
Filename format:	CSOPESY-Project1-<Section>-Group<#>.zip

Deliverables

Zip file containing:

- Program source codes – c files

Specifications

This programming exercise will assess your understanding of basic CPU scheduling algorithms. For uniformity and consistency, the project should be implemented in C.

Implement a simulation of basic CPU scheduling algorithms that conforms to the input-output format prescribed below. The basic CPU scheduling algorithms are:

- First-Come First-Serve (FCFS)
- Shortest-Job First (SJF)
- Shortest-Remaining-Time-First (SRTF)
- Round-Robin (RR)

Input

The program accepts the filename of an input text file which contains the following:

- The first line contains 3 integers separated by space, $X Y Z$.
- X denotes the CPU scheduling algorithm.
- Y denotes the number of processes where $3 \leq Y \leq 100$

- Z denotes a time slice value (applicable for Round-Robin algorithm only), where $1 \leq Z \leq 100$. If the CPU scheduling algorithm indicated by the value of X is not the Round-Robin algorithm, this value must be set (to 1) but ignored.
- See Table 1 below for the CPU scheduling algorithm and the corresponding value of X .

CPU Scheduling Algorithm	Value of X
First-Come First-Serve (FCFS)	0
Shortest-Job First (SJF)	1
Shortest-Remaining-Time-First (SRTF)	2
Round-Robin (RR)	3

Table 1. CPU Scheduling Algorithms and their corresponding value of X .

- There will be Y lines of space-separated integers $A B C$ where A is the process ID, B is the arrival time, and C is the burst time.

Output

The output of the program should include the following:

- Y lines of processes with the start time, end time, and total waiting time. If there are multiple start times and end times for each process, display them in order. See Fig. 1 below.

P[A] start time: $\langle S1 \rangle$ end time: $\langle E1 \rangle$ start time: $\langle S2 \rangle$ end time: $\langle E2 \rangle$... start time: $\langle SN \rangle$ end time: $\langle EN \rangle$ Waiting time: $\langle WT \rangle$
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Figure 1. Output per process.

where $S1 \dots SN, E1 \dots EN, WT \geq 0$.

- An additional last line as displayed in Fig. 2 below.

Average waiting time: $\langle AWT \rangle$

Figure 2. Last line of the output should display the average waiting time.

where AWT indicates the average waiting time of the processes. The output should be sorted according to the process ID A .

Required Program Interaction

There should be minimal program interaction as shown in the sample runs below. The program will just ask the user to input the name of the input text file. If the text file exists, its contents will be processed, the output will be displayed, and the program terminates. If the text file does not exist, the program outputs “ $\langle \text{FILENAME.TXT} \rangle$ not found.” error message and then terminates.

See sample runs below:

Sample Input	Sample Output
0 3 1	P[0] Start Time: 0 End time: 24 Waiting time: 0
0 0 24	P[1] Start Time: 24 End time: 27 Waiting time: 24
1 0 3	P[2] Start Time: 27 End time: 30 Waiting time: 27
2 0 3	Average waiting time: 17.0
2 5 1	P[3] Start time: 3 End time: 6 Waiting time: 0
1 0 7	P[1] Start time: 0 End time: 3 Start time: 6 End time: 10 Waiting time: 3
2 2 5	P[2] Start time: 10 End time: 15 Waiting time: 8
3 3 3	P[5] Start time: 15 End time: 20 Waiting time: 9
4 5 8	P[4] Start time: 20 End time: 28 Waiting time: 15
5 6 5	Average waiting time: 7.0

Figure 2. Sample runs with corresponding input and output.

Working With Groupmates

For this project, you are encouraged to work in groups of at most 2 members. Make sure that each member of the group has approximately the same amount of contribution for the project. Problems with groupmates must be discussed internally within the group, and if needed, with the lecturer.

Deliverables

Submit a zip file containing the source code files via AnimoSpace. Do not include any executable file in your zip file submission.

Academic Honesty Policy

Honesty policy applies. Please take note that you are NOT allowed to borrow and/or copy-and-paste – in full or in part – any existing related program code or solutions from the internet or other sources (such as printed materials like books, or source codes by other people that are not online). You should develop your own codes and solutions from scratch by yourselves.

The student handbook states that (Sec. 5.2.4.2):

“Faculty members have the right to demand the presentation of a student’s ID, to give a grade of 0.0, and to deny admission to class of any student caught cheating under Sec. 5.3.1.1 to Sec. 5.3.1.1.6. The student should immediately be informed of his/her grade and barred from further attending his/her classes.”

The student handbook also states that (Sec. 10.3):

A student caught cheating, as defined in Sec. 5.3.1.1., shall be penalized with a grade of 0.0 in the requirement or in the course, at the discretion of the faculty member, without prejudice to an administrative sanction. In cases of alleged cheating, the faculty member should report the incident to the Student Discipline Formation Office (SDFO).

RUBRIC FOR GRADING

Criteria	Ratings			Points
FCFS	COMPLETE 15 pts The First-Come First-Serve (FCFS) CPU scheduling algorithm is <u>properly implemented</u> .	INCOMPLETE 5 pts The First-Come First-Serve (FCFS) CPU scheduling algorithm is <u>partially implemented</u> .	NO MARKS 0 pt The First-Come First-Serve (FCFS) CPU scheduling algorithm is <u>not implemented</u> .	15 pts
SJF	COMPLETE 15 pts The Shortest-Job First (SJF) CPU scheduling algorithm is <u>properly implemented</u> .	INCOMPLETE 5 pts The Shortest-Job First (SJF) CPU scheduling algorithm is <u>partially implemented</u> .	NO MARKS 0 pt The Shortest-Job First (SJF) CPU scheduling algorithm is <u>not implemented</u> .	15 pts
SRTF	COMPLETE 15 pts The Shortest-Remaining-Time-First (SRTF) CPU scheduling algorithm is <u>properly implemented</u> .	INCOMPLETE 5 pts The Shortest-Remaining-Time-First (SRTF) CPU scheduling algorithm is <u>partially implemented</u> .	NO MARKS 0 pt The Shortest-Remaining-Time-First (SRTF) CPU scheduling algorithm is <u>not implemented</u> .	15 pts
RR	COMPLETE 15 pts The Round-Robin (RR) CPU scheduling algorithm is <u>properly implemented</u> .	INCOMPLETE 5 pts The Round-Robin (RR) CPU scheduling algorithm is <u>partially implemented</u> .	NO MARKS 0 pt The Round-Robin (RR) CPU scheduling algorithm is <u>not implemented</u> .	15 pts
Total points:				60