

Assignment C1

Date of completion
30/01/21

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30/01/21

Title: Scheduling algorithms

Learning Objectives:

To learn and understand

- (i) Process scheduling in multitasking and multiusers OS.
- (ii) Implementation of scheduling algorithms.

Problem Statement:

Write a JAVA program (using OOP features) to implement following scheduling algorithms FCFS, SJF (Preemptive, Non-preemptive), Priority (Non-preemptive) and Round Robin.

Learning outcomes:

The student will be able to-

- (i) Compare the scheduling algorithms
- (ii) Implement FCFS, SJF, RR scheduling algorithms.

Theory:

Process scheduling:

It is an activity process manager that handles the task of scanning process from CPU and running of another process on basis of some strategy.

Such as allows more than one to be loaded in executable memory.

Scheduler:

They are special system software that handles process scheduling in various ways.

Its main task is to select jobs to be submitted into system and to be divided and decide which process to run.

Types of scheduler:

- 1) Long-term scheduler
- 2) Short-term scheduler
- 3) Medium-term scheduler

Some definitions in scheduling are -

- 1) Arrival time is when the process arrives in the system.
- 2) Process time is the execution time required for the process.
- 3) Completion time is the time at which the process is completed.
- 4) Deadline is the time by which the process output is required.
- 5) Turn around time is the time to complete the process after arrival.
- 6) Average or mean turn around time is the average of TAT of all processes.

i) FCFS Scheduling:

The process requests are scheduled in the order of their arrival time.

The pending requests are in a queue. The first request in the queue is scheduled first.

The request that comes is added to the end of the queue.

Algorithm:

- (i) Input the processes along with burst time.
- (ii) Input arrival time for all processes.
- (iii) Sort according to their arrival time along with indices.
- (iv) Perform processes in sorted order.
- (v) Stop.

e) Shortest Job First (SJF) scheduling:

It is an effective approach to minimizing waiting time.

It is easy to implement in batch systems where required CPU time is known in advance.

Algorithm:

- (i) Calculate burst time.
- (ii) Sort all processes in increasing order of burst time.
- (iii) Apply FCFS to sorted list.
- (iv) Perform all processes.
- (v) Stop.

Round Robin scheduling:

- (i) Schedules using time sliding are round robin
- (ii) The amount of CPU time a process may use when allocated is limited.
- (iii) The process is pre-empted if the process requires more time or if process requires I/O operation before the time slice.
- (iv) It makes weighted turn around time approximately equal all time but throughput may not be well as all processes are treated equally

Algorithm:

- (i) Get input for processes with arrival time and burst time.
- (ii) Get the quantum time
- (iii) Sort all processes according to arrival time.
- (iv) Process till all the processes are done.
- (v) End

Priority based scheduling:

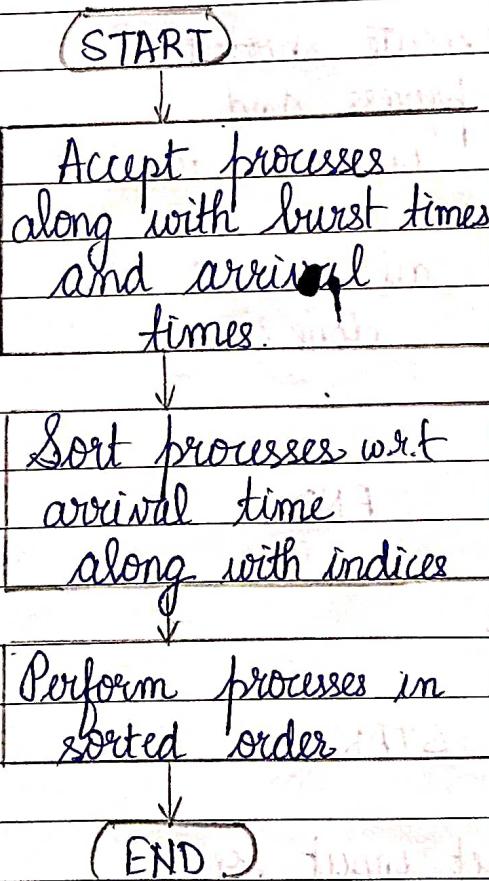
- (i) It is non-preemptive algorithm and one of the common scheduling algorithm in batch systems.
- (ii) Each process is assigned a priority and process with highest priority is executed first and so on
- (iii) Processes with same priority are executed

Algorithm:

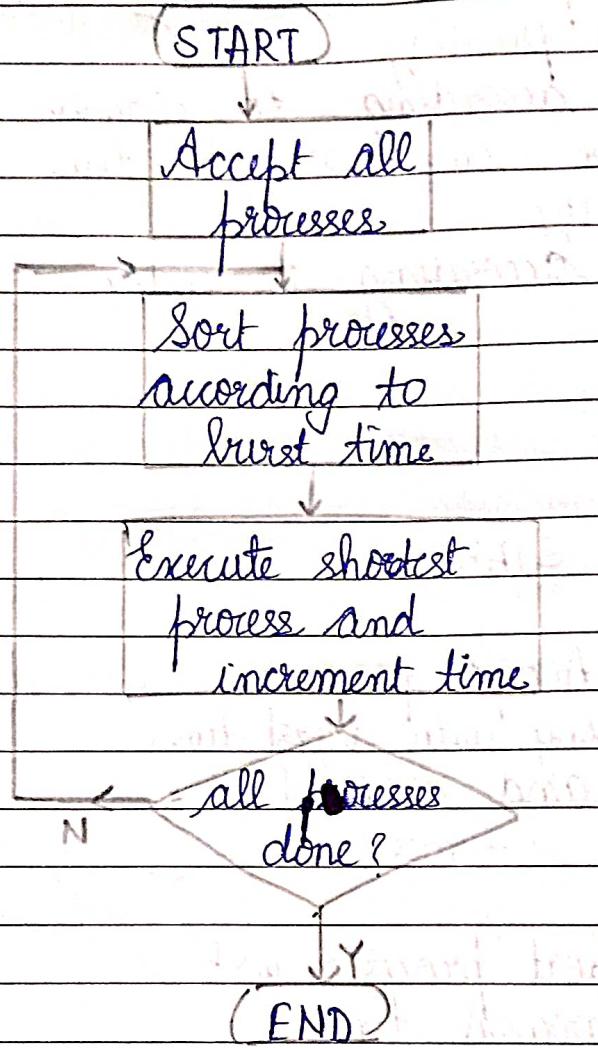
- (i) Get input for processes including arrival time, burst time and priority.
- (ii) Sort processes according to arrival time.
- (iii) If process have same arrival time, sort them by priority.
- (iv) Print process according to index.

Flowchart:

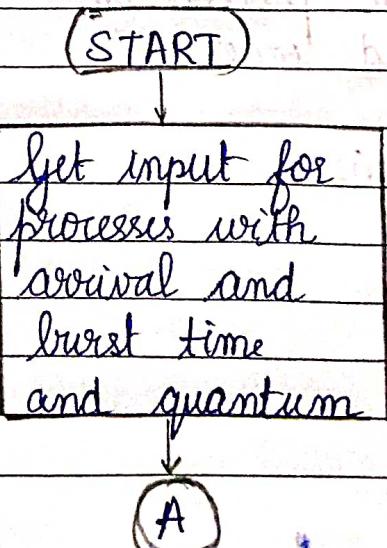
1) FCFS

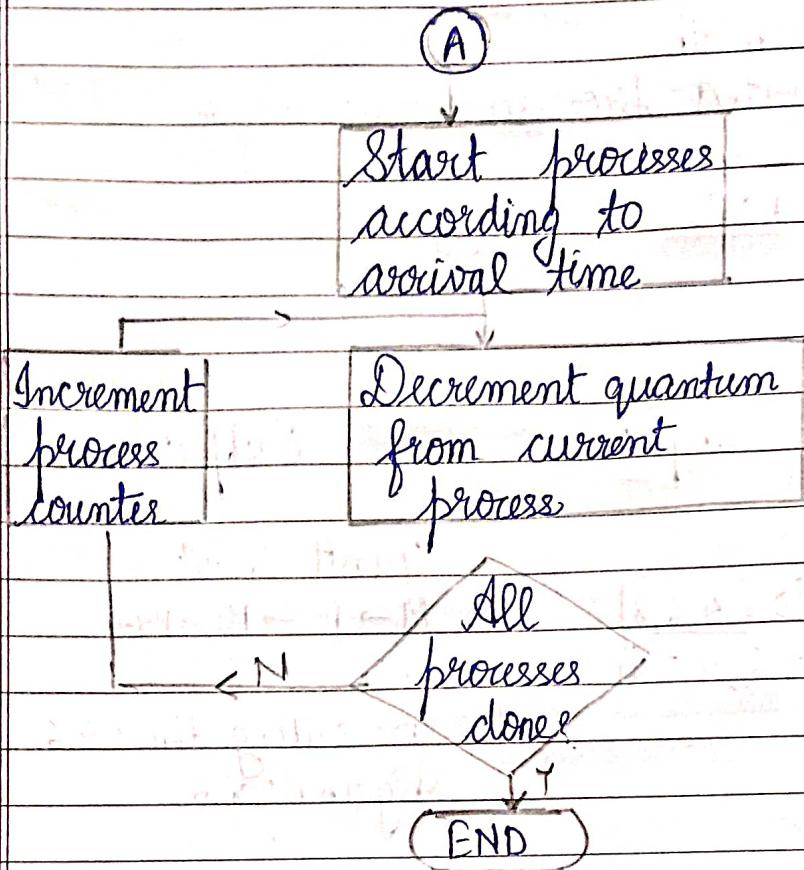


2) Shortest job First (SJF)



3) Round Robin:





4) Priority: Non preemptive (no interruption)

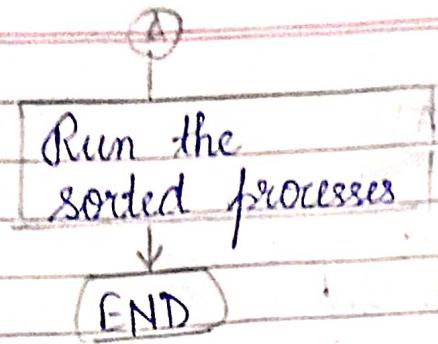
(START)

get input for processes,

Sort processes by arrival time

Sort same arrival time processes by priority

(A)



Testcases:

Algorithm	Input	Output	Result
1) FCFS	N: 5 A: [0, 2, 4, 6, 8] B: [3, 6, 4, 5, 2]	Gantt chart P ₁ → P ₂ → P ₃ → P ₄ → P ₅ Avg waiting time: 4.6 Avg TAT: 8.6	Pass
2) SJF	N: 5 A: [0, 2, 4, 6, 8] B: [3, 6, 4, 5, 2]	Gantt chart P ₁ → P ₁ → P ₁ → P ₂ → P ₃ → P ₃ → P ₃ → P ₅ → P ₅ → P ₂ → P ₂ → P ₂ → P ₂ → P ₄ → P ₄ → P ₄ → P ₄ → P ₄ Avg waiting time: 3.2 Avg TAT: 7.2	Pass
3) Priority Round Robin.	N: 5 Q=3 A: [0, 0, 0, 0, 0] B: [3, 6, 4, 5, 2]	Gantt chart P ₁ → P ₂ → P ₃ → P ₄ → P ₅ → P ₂ → P ₃ → P ₄ Avg wt: 10.4 Avg TAT: 14.4	Pass

4. Priority	N: 5 B: [1, 2, 3, 4, 5] P: [5, 4, 2, 3, 1]	Gantt chart P1 → P2 → P3 → P4 → P5 Avg wt → 7.8 Avg TAT → 10.8	Pass
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Conclusion:

After completing the assignment we concluded that the waiting times are shortest for SJF followed by FCFS (First come First serve), Priority and Round Robin. Turn around times are in order.

SJF < FCFS < Priority < Round Robin.