ASSIGNMENT C1

TITLE: 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 (Preemptive)

OBJECTIVE:

- Process Scheduling in Multitasking and multiusers OS.
- Implementation of Scheduling Algorithms

S/W PACKAGES AND HARDWARE REQUIREMENTS:

- 64-bit Linux OS (Fedora 20)
- Eclipse IDE for JAVA
- 64-bit architecture I3 or I5 machines
- JDK and JRE Installed

OUTCOME:

We will be able to

- Compare the scheduling algorithms
- 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 OS allows more than one to be loaded in executable memory.

Scheduler:

They are special system software that handle 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.

Arrival: The request arrives in the system hen user submits it to OS. When request arrives, the time is called arrival time.
Scheduling: The pending request is scheduled for service when scheduler selects it for servicing.
Preemption: The process is preempted when CPU switches to another process before completing it and this process is added to pending request.
Non preemption: The scheduled process is always completed before next scheduling of the process.
Completion: The process is completed and next process is selected for processing by CPU.
The CPU scheduling takes the information about arrival time, size of request in CPU seconds, CPU time already consumed by the request, deadline of the process for scheduling policy.
CPU scheduling deals with the problem of deciding which of the processes in the ready queue is to be allowed to utilize the CPU. The criteria for selection of an algorithm are

- The maximum throughput
- Least turnaround time.
- Minimum waiting time.
- Maximum CPU utilization.

Some definitions in scheduling are:

Arrival time is when the process arrives in the system.(Ai)
Process time is the execution time required for the process(Xi)
Completion time is time at which the process is completed.(Ci)
Deadline is the time by which the process output is required(Di)
Turnaround time is the time to complete the process after arrival.(Ci-Ai)
Average or Mean turnaround time is the average of turnaround time of all processes.(1/n $\sum \quad (Ci - Ai)$

Weighted time around time is the turnaround time of a process to its execution time. (Ci-Ai)/Xi

Throughput is the measure of performance and no of processes completed per unit time.(n/(max(Ci)-min(Ai))

Scheduling Policies:

FCFS Scheduling:
The process requests are schedules 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.

Performance of FCFS scheduling: (Time in sec)

Process No	Arrival time	Burst Time	Turnaround time	Waiting time
1	0	5	0	0
2	1	3	5	4
3	2	8	8	6
4	3	6	16	13

Average waiting time=(0+4+6+13)/4=5.75

Algorithm:

1) Input the processes along with burst times.
2)Input arrival time for all processes
3)Sort according to their arrival time along with indices.
4)Perform processes in sorted order
5)Stop.

Shortest job first (SJF) scheduling:

est approach to minimize waiting time. It is easy to implement in batch systems where required CPU time is known in advance.

a)**Non-preemptive**

Performance of SJF scheduling: (Time in sec)

Process No	Arrival time Ai	Burst time	Waiting time
1	0	2	1
2	0	3	3
3	1	4	5
4	0	1	0

Average waiting time=2.25

b) **Preemptive:**

Process	Arrival time	Burst time	Waiting time
P1	0	300	425
P2	0	125	150
P3	0	400	725
P4	0	150	275
P5	0	100	0
P6	150	50	0

Average waiting time=262.5

Algorithm

1)Calculate burst time.
2)Sort all processes in increasing order of burst time.
3)Apply FCFS to sorted list.
4)Perform all processes
5)Stop

Round Robin scheduling: Schedules using time slicing. The amount of CPU time a process may use when allocated is limited. The process is preempted if the process requires more time or if process requires I/O operation before the time slice. It makes weighted turnaround time approximately equal all time but throughput may not be well as all processes are treated equally.

Performance of Round Robin scheduling:

Process No	Arrival time Ai	Burst time	Waiting time
1	1	150	250
2	2	100	200
3	3	200	300
4	4	50	150

Time quantum=50
Average waiting time=225

Algorithm:

1)Get input for processes with arrival time and burst time. Take quantum.
2)Sort processes according to arrival time.
3)Process till all processes are done:
4)End

Priority based Scheduling:

It is non-preemptive algorithm and one of the common scheduling algorithm in batch system.
Each process is assigned a priority and process with highest priority is executed first and so on.
Processes with same priority are executed on FCFS basis.

Process	Arrival time	Burst time	Priority	Waiting time
P0	0	5	1	9
P1	1	3	2	5
P2	2	8	1	12
P3	3	6	3	0

Algorithm:

1)Get input for process including arrival time,burst time and priority.
2)Sort process according to arrival time.
3)If process have same arrival time,sort them by priority.
4)Print process according to index.
5)End

Steps to do /algorithm:

1. Create s menu to select various scheduling algorithms
2. Take number of tasks and CPU time as input.
3. Calculate average waiting time and turnaround time for each scheduling strategy.
4. Perform a comparative assessment of best policy for given set of processes.

CONCLUSION:

Thus, we successfully studied and implemented scheduling algorithms like FCFS, SJF, Priority and Round Robin Scheduling, etc.