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| **OS & Networking Fundamentals**  Diploma in CSF/IT  Year 1 (2021/22) Semester 2 | Week **3** |
| **1 hour** |
| **Activity: Process Management – Process Scheduling Schemes** | |

**Objectives**

* To further explore the concept of process management;
* To understand the algorithm of various process scheduling schemes.

**Activity 1: Problem solving in process scheduling**

1. Consider the following 5 processes:

|  |  |  |
| --- | --- | --- |
| **Process** | **Arrival time (ms)** | **CPU burst time (ms)** |
| A | 0 | 10 |
| B | 1 | 1 |
| C | 2 | 2 |
| D | 3 | 1 |
| E | 4 | 5 |

* 1. Draw a Gantt chart for First-Come-First-Serve (FCFS) to show the CPU utilization.

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* 1. Calculate the average turnaround time for the FCFS scheduling scheme:

FCFS:

Process Turnaround time (ms)

A 10

B 10

C 11

D 11

E 15

Average Turnaround time = 11.4 ms

1. Consider the following processes with the associated CPU burst time:

|  |  |  |
| --- | --- | --- |
| Process | Arrival time (3 ms) | CPU burst time (ms) |
| A | 0 | 5 |
| B | 1 | 5 |
| C | 3 | 2 |

* 1. Draw a Gantt chart for Round-Robin (RR), to show the CPU utilization. (Assume time quantum = 3ms)
     1. Draw a Gantt chart to show the CPU utilization.

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* + 1. Compute the average turnaround time.

**Turnaround time of a process = Completion time – arrival time**

Process Turnaround time (ms)

A 11

B 12

C 6

Avg = 9.67

* + 1. Compute the average waiting time.

**Waiting time of a process = Turnaround time – burst time**

Process Waiting time (ms)

A 6

B 7

C 4

Avg = 5.67

**Activity 2:**

1. What are the advantage and characteristics of RR scheduling?

* If only 1 process schedules, it will be executed uninterrupted for the next duration of the time slice.
* If other processes are in line, the executing process is interrupted and goes back to the line of Ready queue.
* The process schedules next is then allowed to execute for next time slice.
* When other processes arrive, they join the line in Ready queue and cycle through execution till completion
* Use of quantum ensures fairness as there will be no hogging or system resources by long processing tasks
* Allows incorporation of other selection schemes to optimize the execution of processes for a system.

1. What is the disadvantage of too large a time quantum for RR scheduling?

If it is too long, it may become a FCFS scheduling scheme.

1. What is the disadvantage when the time quantum for RR scheduling is too small?

It may reduce the throughput due to context switching overhead.

1. What is the disadvantage of FCFS scheduling which is often required to “run to completion”?

First process can be so long that it will hog the CPU and thus throughput can drop dramatically when long processes monopolize the CPU.

Extra Exercises (Optional)

1. Assume there are three running processes with their respective burst time and arrival time as shown in the table below.

|  |  |  |
| --- | --- | --- |
| **Process** | **Arrival Time (ms)** | **Burst time in ms** |
| A | 2 | 5 |
| B | 3 | 5 |
| C | 5 | 5 |

1. With the aid of a Gantt chart, show graphically how the process scheduler will dispatch the processes to the CPU for execution using the **Round Robin** scheduling algorithm with CPU time slices of 3ms.

1. Write the formulae to calculate the turnaround time for a process. Then compute the average turnaround time. Show all wA piece of paper with writing

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1. Write the formulae to calculate the waiting time for a process. Then compute the average waiting time. Show all working.

1. Using the Gantt chart drawn in (i), calculate the idle time of the CPU.

1. If FCFS scheme is used instead, compare its outcome with RR scheme.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | AT | BT | FT | TT | WT |
| A | 2 | 5 |  |  |  |
| B | 3 | 5 |  |  |  |
| C | 5 | 5 |  |  |  |
|  |  |  | Total: |  |  |
|  |  |  | Average: |  |  |