EXPERIMENT - 4

Operating Systems Lab

AIM

Write a program to implement CPU scheduling for Round Robin.

Syeda Reeha Quasar
14114802719
6C7

EXPERIMENT – 4

Aim:

Write a program to implement CPU scheduling for Round Robin.

Theory:

Round Robin is a CPU scheduling algorithm where each process is assigned a fixed time slot in a cyclic way. It is basically the preemptive version of First come First Serve CPU Scheduling algorithm.

- Round Robin CPU Algorithm generally focuses on Time Sharing technique.
- The period of time for which a process or job is allowed to run in a pre-emptive method is called time **quantum**.
- Each process or job present in the ready queue is assigned the CPU for that time quantum, if the execution of the process is completed during that time then the process will **end** else the process will go back to the **waiting table** and wait for the its next turn to complete the execution.

Characteristics of Round Robin CPU Scheduling Algorithm:

- It is simple, easy to implement, and starvation-free as all processes get fair share of CPU.
- One of the most commonly used technique in CPU scheduling as a core.
- It is preemptive as processes are assigned CPU only for a fixed slice of time at most.
- The disadvantage of it is more overhead of context switching.

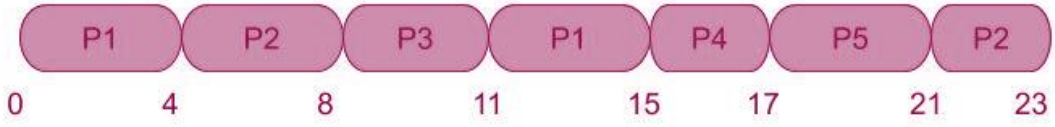
TIME SLICE = 4

PROCESS	ARRIVAL TIME	BURST TIME	
		TOTAL	REMAINING
P1	0	8	8
P2	1	6	6
P3	3	3	3
P4	5	2	2
P5	6	4	4

READY QUEUE:

P1	P2	P3	P1	P4	P5	P2

GANTT CHART:



Source Code:

```
#! /bin/bash

function roundrobin {
  #Initializing Bash variables
   timeQuantum=0
   awt=0
   atat=0
   temp=0
   temp2=0
   GanttChart=0
   totalwt=0
   totaltat=0

   declare -a  wt
   declare -a  tat
echo "Enter the Quantum time -- "; #Accepts user input for Quantum Time and Input
Validation
read -r timeQuantum

while [[ -z "$timeQuantum" ]] || [[ "$timeQuantum" -le 0 ]]
do
echo "Quantum time cannot be blank or less than 1, please try again."
echo "Enter the Quantum time --  "
read -r timeQuantum
done

echo -e "\n\t\t\t\tGantt Chart"
echo -n "0"
  while ((1))
  do
    for ((i = 1,count=0; i <=number; i++))
    do
      temp=$timeQuantum

      if [ "${rem_bt[i]}" -eq 0 ]
      then
        ((count++))

        continue
      fi
```

```
    if [ "${rem_bt[i]}" -gt "$timeQuantum" ]
      then
      rem_bt[$i]=$((rem_bt[i]-timeQuantum))
      GanttChart=$((GanttChart+timeQuantum))
      echo -n " -> P[""$i""] <-" "$GanttChart"
      else
        if [ "${rem_bt[i]}" -ge 0 ]
        then
          temp=${rem_bt[i]};
          GanttChart=$((GanttChart+rem_bt[i]))
          echo -n " -> P[""$i""] <-" "$GanttChart"
          rem_bt[$i]=0;
        fi
    fi
    temp2=$((temp2+temp))
    tat[$i]=$temp2
  done
  if [ "$number" -eq "$count" ]
  then
  break
  fi

 done
  echo -e "\n\nProcess\t    Burst Time    \tWaiting Time\tTurnaround Time"
  for ((i = 1; i <= number; i++))
  {
     wt[i]=$((tat[i]-Btime[i]))
     totalwt=$((totalwt+wt[i]))
     totaltat=$((totaltat+tat[i]))

    echo -e "$i\t\t  ${Btime[i]}\t\t    ${wt[i]}\t\t\t${tat[i]}"
  }
  awt=$(echo 'scale=2;' "$totalwt" / "$number" | bc -l)
  atat=$(echo 'scale=2;' "$totaltat" / "$number" | bc -l)

echo "Total waiting time =" "$totalwt"
echo "Average waiting time =" "$awt"
echo "Total Turnaround Time =" "$totaltat"
echo "Average Turnaround Time =" "$atat"
}

#Accepts user input for Number of Processes and Input Validation
echo "Enter the number of processes -- "
```

```
read -r number
while [[ "$number" -le 1 ]] || [[ -z "$number" ]]
do
echo "Error: Input valid number of processes or Input cannot be blank"
echo "Please try again."
echo "Enter the number of processes -- "
read -r number
done

declare -a Btime
declare -a  p
declare -a  rem_bt

#Accepts user input for Burst Time and Input Validation
for (( i=1; i<=number; i++ ))
do

echo "Enter Burst Time for Process -- $i"
read -r "Btime[i]"

while [[ "${Btime[i]}" -lt 1 ]] || [[ -z "${Btime[i]}" ]]
do
echo "Error: Input valid burst time for the process or Inputs cannot be blank"
echo "Please try again."
echo "Enter Burst Time for Process -- $i"
read -r "Btime[i]"
done
p[i]=$i  #contains process number
rem_bt[i]=${Btime[i]} #remaining process
done

echo -e "CPU burst Time for processes in nano second --" "${Btime[@]}"
echo -e "Process Number for CPU burst time          --" "${p[@]}"
echo ""
echo "Calculation for Round Robin for processes entered are as follows: "
roundrobin
```

Output:

```
reeha@Reeha:/mnt/e/sem 6/Operating Systems$ ./roundRobin.sh
Enter the number of processes --
3
Enter Burst Time for Process -- 1
12
Enter Burst Time for Process -- 2
34
Enter Burst Time for Process -- 3
23
CPU burst Time for processes in nano second -- 12 34 23
Process Number for CPU burst time           -- 1 2 3

Calculation for Round Robin for processes entered are as follows:
Enter the Quantum time --
2

                                Gantt Chart
0 -> P[1] <- 2 -> P[2] <- 4 -> P[3] <- 6 -> P[1] <- 8 -> P[2] <- 10 -> P[3] <- 12 -> P[1] <- 14 -> P[2] <- 16 -> P[3] <- 18 -> P[1] <- 20 -> P[2] <- 22 -> P[3] <- 24 -> P[1] <- 26 -> P[2] <- 28 -> P[3] <- 30 -> P[
1] <- 32 -> P[2] <- 34 -> P[3] <- 36 -> P[2] <- 38 -> P[3] <- 40 -> P[2] <- 42 -> P[3] <- 44 -> P[2] <- 46 -> P[3] <- 48 -> P[2] <- 50 -> P[3] <- 52 -> P[2] <- 54 -> P[3] <- 56 -> P[2] <- 58 -> P[3] <- 59 -> P[2]
<- 61 -> P[2] <- 63 -> P[2] <- 65 -> P[2] <- 67 -> P[2] <- 69

Process     Burst Time          Waiting Time    Turnaround Time
1               12              20              32
2               34              35              69
3               23              36              59
Total waiting time = 91
Average waiting time = 30.33
Total Turnaround Time = 160
Average Turnaround Time = 53.33
```

```
reeha@Reeha:/mnt/e/sem 6/Operating Systems$ ./roundRobin.sh
Enter the number of processes --
5
Enter Burst Time for Process -- 1
5
Enter Burst Time for Process -- 2
7
Enter Burst Time for Process -- 3
3
Enter Burst Time for Process -- 4
8
Enter Burst Time for Process -- 5
4
CPU burst Time for processes in nano second -- 5 7 3 8 4
Process Number for CPU burst time           -- 1 2 3 4 5

Calculation for Round Robin for processes entered are as follows:
Enter the Quantum time --
3

                                Gantt Chart
0 -> P[1] <- 3 -> P[2] <- 6 -> P[3] <- 9 -> P[4] <- 12 -> P[5] <- 15 -> P[1] <- 17 -> P[2] <- 20 -> P[4] <- 23 -> P[5] <- 24 -> P[2] <- 25 -> P[4] <- 27

Process     Burst Time          Waiting Time    Turnaround Time
1               5               12              17
2               7               18              25
3               3               6               9
4               8               19              27
5               4               20              24
Total waiting time = 75
Average waiting time = 15.00
Total Turnaround Time = 102
Average Turnaround Time = 20.40
```

```
reeha@Reeha:/mnt/e/sem 6/Operating Systems$ ./roundRobin.sh
Enter the number of processes --
7
Enter Burst Time for Process -- 1
23
Enter Burst Time for Process -- 2
234
Enter Burst Time for Process -- 3
34
Enter Burst Time for Process -- 4
67
Enter Burst Time for Process -- 5
34
Enter Burst Time for Process -- 6
97
Enter Burst Time for Process -- 7
23
CPU burst Time for processes in nano second -- 23 234 34 67 34 97 23
Process Number for CPU burst time           -- 1 2 3 4 5 6 7

Calculation for Round Robin for processes entered are as follows:
Enter the Quantum time --
20

                                Gantt Chart
0 -> P[1] <- 20 -> P[2] <- 40 -> P[3] <- 60 -> P[4] <- 80 -> P[5] <- 100 -> P[6] <- 120 -> P[7] <- 140 -> P[1] <- 143 -> P[2] <- 163 -> P[3] <- 177 -> P[4] <- 197 -> P[5] <- 211 -> P[6] <- 231 -> P[7] <- 234 -> P[
2] <- 254 -> P[4] <- 274 -> P[6] <- 294 -> P[2] <- 314 -> P[4] <- 321 -> P[6] <- 341 -> P[2] <- 361 -> P[6] <- 378 -> P[2] <- 398 -> P[2] <- 418 -> P[2] <- 438 -> P[2] <- 458 -> P[2] <- 478 -> P[2] <- 498 -> P[2]
<- 512

Process     Burst Time          Waiting Time    Turnaround Time
1               23              120             143
2               234             278             512
3               34              143             177
4               67              254             321
5               34              177             211
6               97              281             378
7               23              211             234
Total waiting time = 1464
Average waiting time = 209.14
Total Turnaround Time = 1976
Average Turnaround Time = 282.28
```