**KSU/CCIS** **CSC227**

# Tutorial # 4 – CPU Scheduling
## SUMMER - 2010

***Question # 1:***

Select the most appropriate answer for each of the following questions:

| | |
|---|---|
| 1. | **…… is the number of processes that complete their execution per time unit** |
| √ | Throughput |
| | Turnaround time |
| | Waiting time |
| | CPU utilization |
| 2. | **Amount of time to execute a particular process** |
| | Throughput |
| √ | Turnaround time |
| | Waiting time |
| | CPU utilization |
| 3. | **Amount of time a process has been waiting in the ready queue** |
| | Throughput |
| | Turnaround time |
| √ | Waiting time |
| | CPU utilization |
| 4. | **One of the optimization criteria for scheduling algorithms** |
| | Min CPU utilization |
| | Min Throughput |
| √ | Min Turnaround time |
| | Max waiting time |
| 5. | **If the time quantum is small in RR, then** |
| √ | The context switch overhead is too high. |
| | The context switch overhead is low. |
| | The context switch overhead is same. |
| | None of the above. |
| 6. | **Which of the following statements is (are) true of multilevel queue scheduling?** |
| | Processes can move between queues. |
| √ | Each queue has its own scheduling algorithm. |
| | It is the most general CPU-scheduling algorithm. |
| | All of the above |
| 7. | **The …. scheduling algorithm is designed especially for time-sharing systems.** |
| | SJF |
| | FCFS |
| √ | RR |
| | Multilevel queue |
| 9. | **Which of the following scheduling algorithms must be nonpreemptive?** |
| | SJF |
| | RR |
| √ | FCFS |
| | priority algorithms |

| | |
|---|---|
| 10. | **…… scheduling is approximated by predicting the next CPU burst with an exponential average of the measured lengths of previous CPU bursts.** |
| | Multilevel queue |
| | RR |
| | FCFS |
| √ | SJF |
| 11. | **...... in a round-robin scheduler gives better response time for interactive users but less efficient use of the CPU.** |
| √ | A short quantum. |
| | A long quantum |
| | It's same. |
| | None of the above. |

***Question # 2:***

List and define the different metrics by which we might evaluate a scheduler

***Answer Q 2:***

**CPU Utilization:** The percentage of time that the CPU is busy.
**Throughput:** The number of processes completing in a unit of time.
**Turnaround time:** The length of time it takes to run a process from initialization to termination, including all the waiting time.
**Waiting time:** The total amount of time that a process is in the ready queue.
**Response time:** The time between when a process is ready to run and its next I/O request.

***Question # 3:***

What are preemptive and non-preemptive scheduling policies?

***Answer Q 3:***

With the non-preemptive scheduling policy, scheduling only occurs when a process enters the wait state or terminates. With the preemptive scheduling policy, scheduling also occurs when a process switches from running to ready due to an interrupt, and from waiting to ready (i.e., I/O completion).

***Question # 4:***

What are the advantages and disadvantages in choosing a small length of the time-slice in Round Robin scheduling?

***Answer Q 4:***

- Better response time for interactive users.
- Less efficient use of the CPU.
- The context switch overhead is too high.

***Question # 5:***

What is the major problem in Priority Schduling? And how to solve it?

***Answer Q 5:***

Problem is Starvation – low priority processes may never execute
Solution is Aging – as time progresses increase the priority of the process

***Question # 6:***

In what way is SJF Optimal?

***Answer Q 6:***
Shortest remaining Time First (Preemptive SJF).

***Question # 7:***

Why is it hard to implement SJF as CPU-scheduler?

***Answer Q 7:***
Prediction of the next CPU burst.

***Question # 8:***

Five processes P1, P2, P3, P4 and P5 arrived in this order at the same time with the following CPU burst and priority values. A smaller value means a higher priority.

| | ***CPU Burst*** | ***Priority*** |
|---|---|---|
| *P1* | 4 | 2 |
| *P2* | 6 | 4 |
| *P3* | 2 | 1 |
| *P4* | 5 | 3 |
| *P5* | 3 | 5 |

a) Draw the Gantt chart for each scheduling algorithms.
b) Fill the entries of the following table for each indicated scheduling policy and each process. Ignore context switching overhead.
c) Which of the schedules results in the minimal average waiting time (over all processes)
d) Which of the schedules results in the minimal average turnaround time (over all processes)

| ***Scheduling Policy*** | ***Waiting Time*** | | | | | ***Average Waiting Time*** |
|---|---|---|---|---|---|---|
| | ***P1*** | ***P2*** | ***P3*** | ***P4*** | ***P5*** | |
| *FCFS* | | | | | | |
| *SJF (Non-Preemptive)* | | | | | | |
| *Priority* | | | | | | |
| *Round-Robin (Time quantum = 2)* | | | | | | |
| ***Scheduling Policy*** | ***Turnaround Time*** | | | | | ***Average Turnaround Time*** |
| | ***P1*** | ***P2*** | ***P3*** | ***P4*** | ***P5*** | |
| *FCFS* | | | | | | |
| *SJF (Non-Preemptive)* | | | | | | |
| *Priority* | | | | | | |
| *Round-Robin (Time quantum = 2)* | | | | | | |

***Question # 9:***

Five processes are entering the ready queue at a certain point of time. Each process is assigned a priority (0 should be the highest):

| ***Process*** | ***Arrival Time*** | ***Burst Time*** | ***Priority*** | ***Waiting Time*** |
|---|---|---|---|---|
| **P1** | 0 | 8 | 4 | |
| **P2** | 3 | 28 | 1 | |
| **P3** | 7 | 12 | 0 | |
| **P4** | 9 | 3 | 2 | |
| **P5** | 15 | 4 | 3 | |

a) Draw a Gantt chart or X-Y graph for illustrating the execution of these processes using ***Short-Job-Time-First scheduling with preemption***, when a process arrive with a lower remaining processing time.

***b)*** Fill the table be finding the ***waiting time*** for each process in ***part (a).***

c) Draw a Gantt chart or X-Y graph for illustrating the execution of these processes using ***Highest-Priority-First without preemption***. (same way in Question #8)

***Question # 10:***

Consider the ***preemptive*** ***Priority CPU scheduling***, and the following six processes (all time unit are expressed in ms), A smaller value means a higher priority.

| | **Arrival Time** | **Priority** | **CPU Bursts** |
|---|---|---|---|
| **P1** | 0 | 4 | 4 |
| **P2** | 2 | 2 | 6 |
| **P3** | 4 | 1 | 2 |
| **P4** | 0 | 3 | 8 |
| **P5** | 6 | 0 | 6 |
| **P6** | 0 | 5 | 4 |

a) Draw the Gantt diagram showing the scheduling of the above processes.

b) Fill in the following table.

| | **Waiting Time** | **Turnaround Time** |
|---|---|---|
| **P1** | | |
| **P2** | | |
| **P3** | | |
| **P4** | | |
| **P5** | | |
| **P6** | | |
| **Average** | | |
| **CPU Utilization % =** | | |