Branch : CSE & IT Batch : Hinglish

Operating Systems

Process Synchronization/ Coordination

DPP 01

[MCQ]

1. Consider the following statements:

S_1: If all jobs have identical run lengths, a RR scheduler provides better average turnaround time than FIFO.

S_2: With a MLFQ scheduler, high priority jobs have longer time-slices than low priority jobs.

Which of the following is true?

(a) Only S_1
(b) Only S_2
(c) Both S_1 and S_2
(d) None of these

[MCQ]

2. Suppose there is a system operating upon round-robin scheduling, If e denotes time that is been needed to do a process switch and if w denotes round-robin time quantum and if n denotes average time that a process is required to run. Then what will be the CPU efficiency under following circumstances. If round-robin time quantum is greater than the average time i.e. (w > n).

(a) n
(b) 1/(n + e)
(c) n/(n + e)
(d) None of these

[NAT]

3. A process spends 20% of its execution time waiting for completion of I/O operation. If there are 8 processes in memory at once, then the probability of CPU time utilized is _____ %. (Assume all I/O operations are overlapped). (Upto 2 decimal places)

[NAT]

4. Considering the exponential average behavior used to predict the next CPU burst. If $\alpha = 0.70$ and $\tau_0 = 30$ ms and previous (T_0 , T_1, T_2, T_3) runs were as 10, 12, 15, 20. The predicted value of τ_4 _____

[MSQ]

5. What are the limitations of Single- Ready queue?

(a) All processes have to use same scheduling technique.
(b) Lots of searching time required to select single process.
(c) Multiple processes cannot run simultaneously.
(d) In a single-ready queue only single process can reside.

[MSQ]

6. Which of the following is/are correct regarding MLQ(Multi-level queue) scheduling?

(a) Some processes may suffer from starvation.
(b) Processes are divided into categories and scheduled on different ready queue.
(c) Multiple scheduling algorithms can be implemented simultaneously.
(d) It has minimal scheduling overhead.

[MCQ]

7. Which process can be affected by other processes executing in the system?

(a) cooperating process
(b) child process
(c) parent process
(d) independent process

[MSQ]

8. A race condition _____

(a) Occurs when two threads enter critical section at the same time.
(b) Occurs when one thread is in critical section and another thread cannot access critical section.
(c) Occurs when two threads access a shared variable at the same time.
(d) None of these

Answer Key

1. **(d)**
2. **(c)**
3. **(1.00)**
4. **(19)**
5. **(a, b)**
6. **(a, b, c, d)**
7. **(a)**
8. **(c)**

Hints & Solutions

1. (d)

S_1 False: If all jobs are identical, RR is horrible for turnaround time because all jobs will complete at nearly the same time.

S_2 False: Since jobs that do a lot of computation (long CPU burst) are given low priority.

2. (c)

We know that,
Efficiency = Useful Time/ Total Time
Useful time in this problem= time taken by a process to run (**n**)
Total Time= time taken by a process to run + time that is been needed to do a process switch (e)

= **n+e**
So,
CPU efficiency = n/ (n+e)
Therefore, option C is the correct answer.

3. (1.00)

n = total number of processes

p = fraction of time a process is waiting for I/O

Probability (all processes waiting for I/O) = p^n

CPU utilization = $1 – p^n$
So, in this p = 20% = 0.2; n = 8
CPU time utilization= $(1- (0.2)^8) = 1.00000256$

4. (19)

Exponential average (Aging) , $\tau_{n+1} = \alpha\, t_n + (1 - \alpha)\tau_n$
T_n is predicted burst time of n^{th} process.
t_n = actual burst time of n^{th} process.
α = is smoothing factor and $0 <= \alpha <= 1$
Given,
$t_0 = 30$
$t_1=10$
$t_2=12$
$t_3=15$
$t_4=20$
$\alpha= 0.7$
So,

$\tau_1 = 0.7(10) + (0.3)\,(30) = 16$

$\tau_2 = 0.7(12) + (0.3)\,(16) = 13.2$

$\tau_3 = 0.7(15) + (0.3)\,(13.2) = 14.46$

$\tau_4 = 0.7(20) + (0.3)\,(14.46) = 18.338 = 19.0$(approx)

5. (a, b)

(a) All processes have to use same scheduling technique. True, in single ready queue all the processes have to use only one ready queue.

(b) Lots of searching time required to select single process. True, if ready queue has n processes, then we need to search n processes to select a single process for scheduling. If there are 1000 processes in ready queue and we need to execute an interactive process, so we need to first search for the category of interactive processes and then select a single process from that category, this require lot of searching time.

(c) Multiple processes cannot run simultaneously. False, On a single CPU, single process can run/execute at a time, so this is not the limitation of ready queue.

(d) In a single-ready queue only single process can reside. False, on a single ready queue, total processes present can be equal to size of ready queue. If ready queue is full than processes are sent to suspend ready state.

Therefore, option A and B are correct.

6. (a, b, c, d)

(a) Some processes may suffer from starvation. Correct, MLQ has starvation. So, this is correct statement.

(b) Processes are divided into categories and scheduled on different ready queue. Correct, different processes are on different ready queues, like there will be queue for system processes, another queue for interactive processes, etc.

(c) Multiple scheduling algorithms can be implemented simultaneously. Correct, On multiple queue's multiple scheduling algorithms can be implemented simultaneously.

(d) It has minimal scheduling overhead. Correct, As MLQ assigns permanent queues to the processes therefore, it has the advantage of low scheduling overhead.

7. (a)

A cooperating process can be affected by other processes executing in the system. Also it can affect other processes executing in the system. A process shares data with other processes, such a process is known as a cooperating process.

8. (c)

A race condition **occurs when two threads access a shared variable at the same time**. Therefore, option c is correct.