00284

Sri Lanka Institute of Information Technology

B.Sc. Special Honours Degree
in
Information Technology

Mid Term Examination
Year 3, Semester 1 (2012)

Operating Systems (302)

Duration: 1 Hour

Instruction to Candidates:

- This paper has 3 questions. Answer All Questions.
- Total Marks 30.
- This paper contains 6 pages with Cover Pager.
- Calculators are allowed.

Question One (09 marks)

1. **(2 marks)** Briefly explain the difference between multiprogramming and timesharing systems.

Answer:

2. **(1 mark)** One purpose of the operating system is to simulate features that are not available on hardware. Give two such features simulated by operating system.

Answer:

3. **(2 marks)** What is the goal of using the Simultaneous Peripheral Operation On Line (SPOOL)? Briefly describe how SPOOL works.

Answer:

4. **(2 marks)** Compare and contrast *virtual machine architecture* and *micro kernel architecture*?

Answer:

5. **(2 mark)** Compare and contrast Symmetric Multiprocessing and Asymmetric Multiprocessing systems?

Answer:

Question Two (12 marks)

1. **(2 marks)** A process may be in one of five different process states. Describe the five process states. Describe why an OS must keep the Program Counter information for each process.

Answer:

2. **(2 marks)** Briefly describe the purpose of the following system calls and library functions.
    a) *time(2)*
    b) *execl(2)*
    c) *pthread_create(3)*
    d) *pthread_join(3)*

Answer:

3. **(1 mark)** A signal is used to notify a process that a particular event has occurred. In a multithreaded system, to which thread should a signal be delivered?
Answer:

4. **(2 marks)** What two advantages do the threads have over the multiple processes? What major disadvantage do they have?

Answer:

5. **(5 marks)** Consider the following program.

```
#include <stdio.h>
#include <unistd.h>

for(i = 0; i < 3; i++)
{

        if (pid = fork() < 0)
        {

                // do something
        }

        else if (pid == 0)
        {

                // do something
                return 0;  // Line A
        }

}
for (i = 0; i < 3; i++) //Line B
        wait();          // Line C
```

a) How many processes are created? Justify your answer.
b) Which process creates the new process, the parent or the child process? Justify your answer.
c) Describe what would happen if we remove **Line B** and **Line C**?
d) How many processes are created if we remove **Line A**? Justify your answer.

Answer:

a)

b)

c)

d)

Question Three (09 marks)

1. **(1 mark)** The long-term scheduler controls the degree of multiprogramming. What is the degree of multiprogramming?

Answer:

1. **(3 marks)** Windows XP schedules threads using a priority-based preemptive scheduling algorithm. Each thread is given a time quantum.
   a) Explain the meaning of preemptive scheduling.
   b) Discuss why a shorter time quantum reduces the CPU utilization.
   c) In such system, one possible context switch occurs when a running thread terminates. Describe three other possibilities for a context switch from a running thread to another thread. Give two reasons for the system to select a new process to run.

Answer:

a)

b)

c)

2. **(5 marks)** Given the following set of processes with their arrival times and burst times.

Process	Arrival time in milliseconds	Burst time in milliseconds
A	0	7
B	2	5
C	4	2
D	5	5

a) Draw a Gantt chart for round-robin (quantum = 3 milliseconds) scheduling considering the **context switching** time as 0.1 milliseconds.
b) Compute the average waiting time.

Answer: