靜宜大學 97 學年度碩士班招生考試試題

系所：資訊工程學系　　科目：作業系統　　共 4 頁

Part I. Multiple Choice Questions.

Please select and mark appropriate answers. (5 points each)

Q1. Which of the following statement is NOT correct?

(1) The most important measurement for a real-time operating system is response time.

(2) The Shortest-Job-First CPU scheduling policy can lead to minimal average waiting time.

(3) Time-sharing systems generally use Round-Robin CPU scheduling.

(4) A multi-programming system must be a time-sharing system.

(5) All alternatives

Q2. Which condition as follows will result in a job (or task) from running state to the blocked (or waiting) state?

(1) task termination

(2) task is time out (or expiry of given time)

(3) task completes the I/O transfer

(4) task completes the resource allocation

(5) task needs an I/O transfer

Q3. Which condition as follows will result in a job (or task) from running state to the ready state?

(1) task termination

(2) task is time out (or expiry of given time)

(3) task completes the I/O transfer

(4) task completes the resource allocation

(5) task needs an I/O transfer

Q4. Which of the following instructions could be allowed in user mode?

(1) Disable all interrupts

(2) Change the memory map

(3) Set the time-of-day clock

(4) Read the time-of-day clock

(5) None of above

Q5. Select the correct one from the following statements:

(1) Switching between user-level threads can be done independently of the operating system and, therefore, very quickly.

(2) Shared memory is useful when smaller numbers of data need to be exchanged; message passing allows maximum speed and convenience of communication.

(3) A thread is a basic unit of CPU utilization, and consists of text, a program counter, a register set, and a stack space.

(4) All system programs run in kernel mode which is protected from user tampering.

(5) All alternatives are incorrect.

Q6. Which of the following solutions does not have the defect of requiring busy waiting for race condition?

(1) The TSL instruction

(2) Semaphores

(3) Peterson's solution

(4) Strict alternation

(5) All alternatives are correct

Q7. When a new thread is created in a process, which is not necessary for that thread?

(1) A new thread ID

(2) A new code segment

(3) A new register set

(4) A new program counter

(5) All alternatives are correct

Q8. Five jobs are waiting to be run. Their expected run times are 9, 6, 3, 5 and X. In what order should they be run to minimize average response time if $6<X\leq 9$?

(1) X, 3, 5, 6, 9
(2) 3, X, 5, 6, 9
(3) 3, 5, X, 6, 9
(4) 3, 5, 6, X, 9
(5) (3, 5, X, 6, 9)%3

Q9. The aging algorithm with α=0.5 is being used to predict run times in SJF scheduling. The first predicted time is 30 msec. The exact execution time of previous four runs, from oldest to most recent are 40, 20, 40, and 35 msec. What is the prediction of the next time?

(1) 25 msec
(2) 30 msec
(3) 35 msec
(4) 40 msec
(5) 50 msec

Q10. Which of the following operating systems has the property that one or more physical devices external to the computer generate stimuli, and the computer must react appropriately to them within a fixed amount of time?

(1) Batch
(2) Time-sharing
(3) Real-time
(4) Distributed
(5) Parallel

Q11. Suppose that a computer can execute 1 billion instructions/sec and that a system call takes 1000 instructions, including the trap and all the context switching. How many system calls can the computer execute per second and still have half of the CPU capacity for running application code? (in millions)

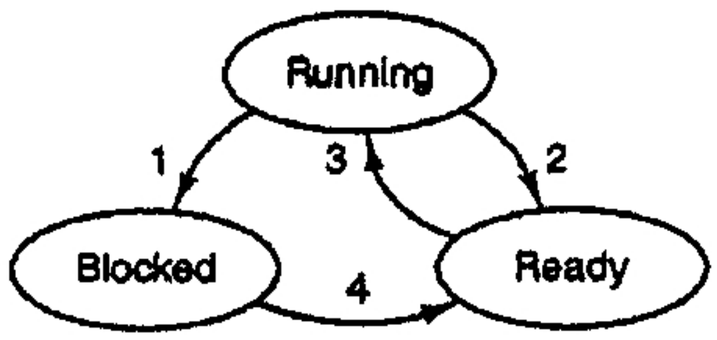
(1) 5
(2) 50
(3) 500
(4) 5000
(5) 500*500

Q12. A process running on CTSS needs 50 quanta to complete. How many times must it be swapped in, including the very first time (before it has run at all)?

(1) 5
(2) 6
(3) 7
(4) 8
(5) max(5, 6, 7, 8)

Part II. Please answer objectively the following questions.

Question 1. (15 points) A process is an executing program, including the current values of the program counter, registers, stack, open files, alarms and other variables and internal states. Although they are independent entities, processes often need to communicate, interact and synchronize with other processes. Therefore, their state may change from time to time, as show in the figure that follows next.



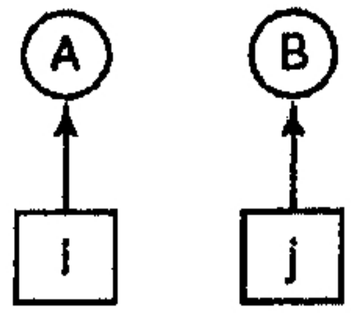
Redraw the figure above by **adding two** new states: New and Terminated. When a process is created, it is initially in the New state. When it exits, it is in the Terminated state.

Question 2. (10 points) In a system with threads, is there normally one stack per thread or one stack per process. Explain and give details that explain your answer.

Question 3. One of strategies used for preventing deadlocks is to impose suitable restrictions on processes so that deadlocks are structurally impossible. "Circular Wait" can be eliminated in several ways, and one of these alternatives is to provide a global numbering of all resources, as figure below.

1. Imagesetter
2. Scanner
3. Plotter
4. Tape drive
5. CD Rom drive

(a)



(b)

Please answer the following:

(1) (10 points) Explain the rule how this algorithm works

(2) (5 points) Using resource allocation graph, demonstrate that this rule can never have cycles. (Hint: **to compare** values of **i** and **j**)