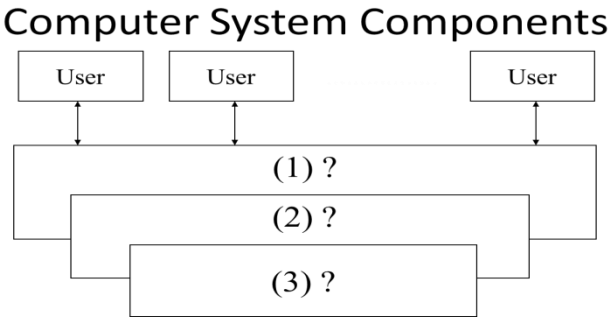
長庚大學102學年度第一學期作業系統第一次期中測驗

系級: 姓名: 學號:

1. (6%)下圖為一般電腦系統之組成，請將Operating System、Application Programs、Hardware，分別填入下圖中(1)、(2)、(3)對應之正確位置。



Answer: (1)→ Application Programs(2%), (2)→ Operating System(2%), (3)→ Hardware(2%)

2. (10%)在作業系統中請說明Multiprogramming及Time Sharing的定義。

Answer: Multiprogramming: The operating system keeps several jobs in memory simultaneously (5%).
(如果說明其特色及Multiprogramming的目的，亦給分)
Time Sharing: Time sharing is a logical extension of multiprogramming, in which CPU switches jobs frequently so that users can interact with each job while it is running (5%).

3. (10%)請解釋Dual-Mode Operation。

Answer: Dual-mode operation allows OS to protect itself and other system components:
- It consists of user mode and kernel mode.
- It provides ability to distinguish when system is running user code or kernel code.
- Some instructions designated as privileged so that they are only executable in kernel mode.
- System calls can change the mode to kernel mode.
- When a job returns from a system call, the mode is reset to user mode.

(答對一項給4分，兩項8分，三項以上10分)

4. (10%)請描述API、System-Call、Operating System三者之間的關係。

Answer: The system calls provide the routines for user applications to use the functions provided by the operating system(5%). The API of a programming language serves as a user-friendly link to system calls made available by the operating system(5%). Thus, most of the details of the operating-system interface are hidden from the programmer by the API and are managed by the run-time support library.

5. (6%)System Call呼叫時參數傳遞有那些方法?

Answer: Put parameters in registers(2%). Use register to point to parameter blocks(2%). Keep parameters in a stack(2%).

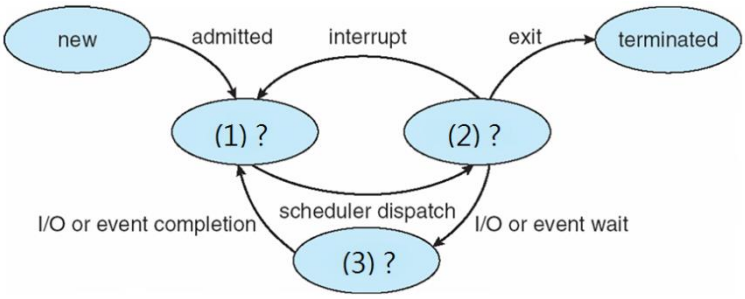
6. (10%)在作業系統中請說明Microkernel System Architecture的設計理念為何？Microkernel System Architecture有何優缺點?

Answer: Concept: moving all nonessential components from the kernel to the user or system programs
Advantage: portability, reliability, security
Disadvantage: the overheads of extra system calls
(答對一項給4分，兩項8分，三項10分)

7. (8%)請定義Program和Process的不同。

Answer: A program is a passive entity stored on hard disk, and a process is an active entity which is loaded into memory for the execution on a CPU.

8. (6%)下圖為Diagram of Process States，請問圖中(1)、(2)、(3)分別為何種狀態。



Answer: (1)→ Ready(2%), (2)→ Running(2%), (3)→ Waiting(2%)

9. (9%)請定義Long-Term Scheduler、Short-Term Scheduler、Medium-Term Scheduler。

Answer: Long-term scheduler selects which processes should be brought into the ready queue. (3%)
Short-term scheduler selects which process should be executed next and allocates CPU. (3%)
Medium-term scheduler can be added as swapper to remove processes from memory and bring them back from disk to continue execution. (3%)

10. (9%)在作業系統的Multithreading Models中，請定義Many-to-One Model、One-to-One Model、Many-to-Many Model，並說明三者各自的優點。

Answer: Many-to-One Model: Many user threads are mapped to one kernel thread.(2%) It is Efficiency. (1%)
One-to-One Model: One user thread is mapped to one kernel thread.(2%) One system call can block only one thread. (1%)
Many-to-Many Model: Many user threads are mapped to many kernel threads.(2%) It is a combination of parallelism and efficiency.(1%)

11. (8%)請說明Thread-Local Storage (TLS)的用途，並說明TLS與Local Variable有何不同。

Answer: Purpose: TLS allows each thread to have its own copy of data.(4%)
Difference: Local variables are visible only during single function invocation, but TLS visible across function invocations in a thread. (4%)

12. (12%)請寫出以下程式在POSIX環境下執行後的輸出結果。

```
#include<sys/types.h>
#include<stdio.h>
#include<unistd.h>
int main()
{
        pid_t pid, pid2;
        pid = fork();
        if (pid == 0)
        {
                printf("Hello\n");
                pid2 = fork();
                if (pid2 != 0)
                {
                        wait(NULL);
                        printf("The OS midterm\n");
                }
                else
                {
                        printf("I would say that\n");
                }
        }
        else
        {
                wait(NULL);
                printf("Is quite easy\n");
        }
        return 0;
}
```

Answer:

Hello (3%)

I would say that (3%)

The OS midterm (3%)

Is quite easy (3%)