淡江大學 101 學年度碩士班招生考試試題

系別：資訊工程學系
資訊工程學系資訊網路與通訊碩士班

科目：作 業 系 統

考試日期：2 月 26 日(星期日) 第 2 節　　本試題共 8 大題， 2 頁

1. **Interprocess Communication (IPC)** (10%)
   (a) What are two fundamental models of it? (5%)
   (b) What are their advantages and disadvantages? (5%)

2. **Process** (10%)
   (a) Including the initial parent process, how many processes are created by the following program? Give a graphical model to explain your answer. (5%)
   (b) What are the output results? Explain your answer. (5%)

```
#include <stdio.h>
#include <unistd.h>
int main()
{
   int k = 0;
   printf("%d\n", k);
   fork();   k++;   printf("%d\n", k);
   fork();   k++;   printf("%d\n", k);
   fork();   k++;   printf("%d\n", k);
   return 0;
}
```

3. **Deadlock Avoidance** (20%)
   Consider the following snapshot of a system. Suppose there are 5 processes (P_1 through P_5) and 3 different resource types (A has 10 instances, B has 5 instances, and C has 7 instances). Answer the following questions using the *Banker's Algorithm* for deadlock avoidance.

	Allocation			***Max Required***			***Available***		
	A	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
P_1	0	1	0	7	5	3	?	?	?
P_2	2	0	0	3	2	2			
P_3	3	0	2	9	0	2			
P_4	2	1	1	2	2	2			
P_5	0	0	2	4	3	3			

   (a) What is the value of the vector ***Available***? (5%)
   (b) What is the value of the matrix ***Need***? (5%)
   (c) Is the system in a safe state? Why? (5%)
   (d) If a request from process P_1 arrives for (0, 2, 0), can the request be granted immediately? (5%)

4. **Endian** (10%)
   Let A be a 4-byte integer whose hexadecimal representation is 0x12345678. (10%)
   (a) In a big-endian machine, which byte will be stored first? (3%)
   (b) Similarly, in a little-endian machine, which byte will be stored first? (3%)
   (c) Give two example CPUs (or machines) that employs big-endian and little-endian, respectively. (4%)

背面尚有試題

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5. **Thread** (10%)
Which of the following components of program state are shared across threads in a multithreaded process? (10%)
(a) Register values,
(b) Heap memory,
(c) Global variables,
(d) Stack memory.

6. **CPU scheduling** (15%)
Consider the following set of processes, with the length of the CPU burst time given in milliseconds.

Process	Burst Time	Priority	Arrival Time
P_1	7	5	0
P_2	5	3	1
P_3	2	1	2
P_4	4	0	4
P_5	3	2	5

Draw the Gantt chart and compute the average waiting time for each of the following scheduling algorithms:
(a) Shortest Remaining Time First (without considering priority), (5%)
(b) Preemptive Priority (a smaller priority number implies a higher priority), and (5%)
(c) Round Robin (RR) with time quantum = 3 (without considering priority). (5%)

7. **Page Replacement** (15%)
Consider the following page-reference string:
1, 3, 5, 6, 2, 3, 4, 5, 7, 4, 3, 1, 6, 3
How many page faults would occur for the following replacement algorithms, assuming four frames allocated for each process?
(a) Optimal, (5%)
(b) LRU, (5%)
(c) Second-chance. (5%)

8. **Paging System** (10%)
Consider a paging system with the page table stored in memory.
(a) If a memory reference takes 100 nanoseconds, how long does a paged memory reference take (without Translation Look-Aside Buffers (TLB), an associative memory)? (5%)
(b) If we add TLBs, and 90% of all page-table references are found in the TLBs, what is the effective memory reference time? Assume that finding a page-table entry in the TLBs takes 20 nanoseconds. (5%)