

## 國立台灣科技大學九十六學年度碩士班招生試題

系所組別：電子工程系碩士班甲組

科目：作業系統

總分 100 分

- (a) (3%) What is a monitor?  
(b) (3%) What is an object?  
(c) (4%) What is the essential difference between a monitor and an object?
- (10%) After executing the program shown below, what is the output on the screen? (fork() is a system call to generate a child process which is a copy of the parent process. Wait() is a system call allowing the calling process to block until a child process terminates.)

```
main()
{
    int status, pid;
    printf("first\n");
    pid=fork();
    printf("second\n");
    if( pid != 0) {
        wait(&status);
        printf("third\n");
    } else {
        printf("fourth\n");
    }
    printf("fifth\n");
}
```

- (10%) To insert an item into a singly linked list requires two pointers to be changed. Suppose a process is context switched out after changing the first, but not the second. Draw a diagram of this situation. If the next process to run now tries to traverse this same list, what will happen?
- (10%) Five batch jobs A through E, arrive at a computer center at almost the same time. They have estimated running times of 12, 8, 2, 4, and 10 minutes. Their (externally determined) priorities are 3, 5, 2, 1, and 4, respectively, with 5 being the highest priority. For each of the following scheduling algorithms, determine the mean process turnaround time. Ignore process switching overhead.
  - Round robin.
  - Priority scheduling.
  - First-come, first served (run in order A, B, C, D, E).
  - Shortest job first.

For (a), assume that the system is multiprogrammed, and that each job gets its fair share of the CPU. For (b) through (d) assume that only one job at a time runs, until it finishes. All jobs are completely CPU bound.

- (10%) Process descriptors could be kept on hash queues. How would this compare for efficiency with static tables and linked lists?

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6. (10%) Operating systems frequently exploit locality to improve performance. Please describe two examples where operating system do so, and state how locality is exploited.

7. (10%) Consider a demand paging system. We measure the various resource utilizations and see:

CPU utilization 20%

Paging disk 99%

Which of these (if any) should improve the CPU utilization? Why?

- (a) Install a faster CPU.
- (b) Install a bigger disk.
- (c) Install more memory.
- (d) Increase the degree of multiprogramming.
- (e) Decrease the degree of multiprogramming.

8. (10%) If data-block access time and reliable are major criteria to implement a **read-only** video file, which of the following file descriptor data structure is "efficient and reliable" to handle sequential access of **large read-only** video files? Explain your answers.

- (a) Contiguous allocation
- (b) Linked allocation
- (c) Unix i-node

9. (10%) Most modern computer systems support a large logical-address space ( $2^{32}$  to  $2^{64}$ ). In such an environment, the page table itself becomes excessively large.

Please describe three most common techniques for structuring the page table, which can reduce the page table size.

10. (10%)(a)(5%) Please describe a memory-management approach, in which programs can be larger than physical memory.

(b) (5%) Consider the following segment table:

<i>Segment</i>	<i>Base</i>	<i>Length</i>
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses?

- (i) 110
- (ii) 2500