

國立臺灣師範大學資訊工程學系
九十九學年度第二學期
博士班資格考

考試科目：作業系統

總分一百分

請在答案卷作答，在題目卷上作答不予計分

1. **(10pts)** Consider two concurrently running processes: P1 with a statement S1, and P2 with a statement S2. We require that S2 be executed after S1 has completed. S1 and S2 share a common semaphore Y, initialized to 0. Please show both in P1 and P2 how you achieve the goal described above.
2. **(10pts)** The CPU scheduling criteria include: CPU utilization, throughput, turnaround time, waiting time, response time. Please explain each one of them.
3. **(10pts)** Describe Round-Robin scheduling and give an example by illustrating how this algorithm schedule 3 processes in terms of processes, burst time, and time quantum. Which of the 5 criteria it performs the best and why?
4. **(10pts)** Windows XP and Windows 2000 are both nonpreemptive kernels. Explain what this means and what are the advantages and disadvantages of a nonpreemptive kernel.
5. **(10pts)** What is the relationship between a guest operating system and a host operating system in a system like VMware(Virtual Machine)? What characters should the host operating system have?
6. **(10pts)** Please explain in short sentences
 - (1) DMA (Direct Memory Access)
 - (2) mount/umount (Unix commands)
 - (3) cylinder
 - (4) open-file table
 - (5) memory-mapped I/O

7. **(10pts)** In principle, dynamic allocation leaves external fragmentations which are difficult to manage and memory compaction is expensive. So, fixed allocation methods such as paging hardware were introduced to overcome the problem for user programs. However, dynamic allocation is still needed for kernel memory management. Please suggest a dynamic allocation which has little external fragmentation, and has little overhead trying to do compaction of memory. In addition, please explain how the method works briefly.

8. **(15pts)** Consider the following page-reference string

1 2 3 4 2 1 5 6 2 1 2 3 4 7 6 3 2 1

Assume there are only 3 frames available. All frames are initially empty, so your first unique pages will all cost one fault each. For each of the following algorithm, please show FINAL content of the page frames after the page-reference string above are processed by the algorithm.

- (1) LRU replacement
- (2) CLOCK (Second chance) replacement
- (3) Optimal replacement

9. **(15pts)** Suppose a FAT file system has 32 bit pointer (i.e., a FAT32 file system). Let a disk block be 4K bytes.

- (1) What is the maximum capacity of this file system (in bytes)?
- (2) Suppose we want to format a disk partition with the maximum capacity of FAT32, how much disk space should be allocated for FAT (File Allocation Table) (in bytes)?