

國立台灣科技大學九十五學年度碩士班招生試題

系所組別：資訊工程系碩士班

科目：作業系統

總分 100 分

1. If a process asks for an available new resource, it gets the resource and keeps what it already has. If the new resource is not available, the process releases all resources. (a) With this scenario, is deadlock possible? (b) Is there any danger that the new resource is acquired but existing ones of the process are lost? (10%)
2. You have a 7200-rpm disk with a track-to-track seek time of 1 msec. The disk has 200 sectors of 1 KB each on each track. What is the maximum data rate in MB/sec? (10%)
3. If a disk is compacted every time a file is removed, all files in the disk are thus contiguous. Reading a file and writing it back require the same amount of time. (a) Assuming a seek time of 4 msec, a rotational delay of 3 msec, a transfer rate of 16 MB/sec, and an average file size of 16 KB, how long does it take to read a file into main memory? (b) How many hours would it take to compact a quarter of a 32-GB disk? (10%)
4. A file system uses 4-KB disk blocks. (a) If all files were exactly 1 KB, what fraction of the disk space would be wasted? (b) Do you think the wastage for a real file system will be higher than this number or lower than it? Explain your answer by giving an example. (10%)



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5. A Computer has four page frames as shown below, and every page has information like the time of loading, time of last access, and reference bit maintained by page replacement module. If the next page replacement would happen at next instruction, which page would be replaced if the module uses
- FIFO algorithm (4%)
 - Second chance replace? (4%)
 - LRU algorithm (4%)

Give your reasons for the answers in brief, or no point will be given.

Page	Loaded	Last ref.	R
0	126	280	1
1	230	265	0
2	140	270	0
3	110	285	1

6. A virtual memory system has a page size of 4,096 bytes and is implemented on a computer system supporting 32 bit physical address and 40 bit virtual address. The OS reserves upper half of virtual addressing space for itself and opens the lower half to applications.
- If there is one big page table for every process, and for every page OS maintains dirty bit, reference bit and valid bit, than what is the size of a page table? (5%)
 - If the computer instead use a 2 level page table such that the leftmost 12 bits of the virtual address are used to index top-level page table. Then for a running process allocated three contiguous 16MB memory blocks, what's the total size of its page tables? Assume that there is only valid bit and physical address reference in each entry of the top-level page table, and all memory blocks are aligned to page bound. (10%)
7. The table below lists all running processes of a machine with their arrival time and CPU burst times (all in msec).
- If all processes are queued according to their arrival time, and round-robin scheduler is used, which process would have the shortest response time? (5%) Your answer should be derived from calculation of 4 response times with context-switch time negligible.
 - If dynamic priority is calculated by current weighting time, and the process with highest priority gains CPU for every switch, what would the execution order be? (4%) And what is the average response time? (4%)

Process	Arrival Time	CPU Burst Times
A	0	4, 2
B	2	3, 8, 1
C	3	6, 6
D	5	1, 1, 3



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8. The four major categories of benefits that may be obtained from multithreaded programming are as listed below. However, when the threads are created just in user space (i.e. user-level threads), some of the benefits below cannot be obtained. Point out the ones that cannot be obtained and explain why. (10%)
- (a) Responsiveness: allow a program to continue running even if part of it is blocked.
 - (b) Resource Sharing: threads share the memory and the resource of the process to which they belong.
 - (c) Economy: it is more economical to create and context-switch threads.
 - (d) Utilization of multiprocessors: threads may be run in parallel on different processors.
- 9.1 A situation, where several processes access and manipulate a same data concurrently and the final value of the data depends on the particular order in which the accesses take place, is called a race condition. If the process scheduling algorithm used in an operating system is non-preemptive, will race condition occur? Why? (5%)
- 9.2 There are two types of semaphores, i.e. spin-lock and suspend-lock. Why spin-lock is not appropriate for uniprocessor system? (5%)

