

考試 日期 (星期)	月	日	上午 下午	第 份	數	任 課 教 師
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研究所
 大學部
 工程在職進修

博士班
 系級別：
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1. In an OS, the round-robin queue-scheduling algorithm with three queues is used for CPU scheduling. These queues are designated for (i) system processes, (ii) interactive processes, and (iii) batch processes, respectively.

(a) Why should the processes in the batch queue be scheduled with FCFS (first come first serve) algorithm? (8%)

(b) Why should the processes in the interactive queue be scheduled with RR (round robin) algorithm? (7%)

2. Three page table structures are (i) hierarchical page table, (ii) hashed page table, and (iii) inverted page table. In a 64-bit CPU, why is the structure of inverted page table usually adopted instead of the structure of hierarchical page table? (8%)

3(a). Under demand paged memory management, a good page-replacement algorithm should be used to minimize the number of page faults. How many page faults will occur if the LRU (least recently used) page replacement algorithm is adopted for the page reference string below with four page frames that are initially empty? (8%)

2, 1, 4, 3, 5, 4, 3, 2, 6, 8, 7, 8, 7, 9, 8, 7, 9, 5, 3, 5, 3, 1

3(b). With demand paged memory management, a process is thrashing if it is spending more time paging than executing. Therefore, thrashing may result in extreme low CPU utilization if most processes are thrashing. Give a method to prevent thrashing from occurring, and explain why the method given can prevent thrashing from occurring. (9%)

4. Consider a file system that uses i-nodes to represent files. Disk blocks are 4 KB in size, and a pointer to a disk block requires 4 bytes. An i-node has pointers to 12 direct disk blocks, one single, one double, and one triple indirect disk blocks. What is the maximum size of a file that can be stored in this file system? (10%)

5. Please explain the differences of two common interprocess communication mechanisms. (8%)

6. (a) Please write a program for producer and consumer processes in bounded-buffer problem by using semaphore to resolve synchronization issue. (10%)

6. (b) One type of semaphore implementation for process synchronization is "spin-lock" (i.e., busy waiting). What's the disadvantage of such implementation? (4%)

6. (c) To overcome the disadvantages of spin-lock, how can we implement the signal() and wait() operations of semaphore? (8%)

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國立臺灣科技大學
考試科目：Operating System

101學年度第 1 學期

研究所
 大學部
 工程在職進修

博士學位考試命題用紙
第 2 頁共 2 頁

7. A system has four processes and five resources. The current allocation and maximum needs are as follows:

	Allocation					Max					Available				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
P_1	1	0	2	1	1	1	1	2	1	3	0	0	x	1	1
P_2	2	0	1	1	0	2	2	2	1	0					
P_3	1	1	0	1	0	2	1	4	1	0					
P_4	1	1	1	1	0	1	1	2	2	1					

What is the smallest value of x for which this is a safe state? (5%)

8. (a) Draw the State Transition Diagram of a process and write in the diagram the name of a transition. Please also explain the reason why a transition between states occurs. (11%)

8. (b) Please explain the main difference between multiprogramming and time sharing by using the State Transition Diagram you answered in (a). (4%)