

考試 時間	月 (星期)	日上午 下午第 節	份數	任課 教師
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國立臺灣科技大學

108學年度第 1 學期

博士班 考試命題用紙

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1. Describe the producer-consumer problem and provide at least two examples of the producer-consumer pairs. (8%)

2. (a) Describe the four required conditions for deadlock. (8%)
(b) Based on (a), provide at least two methods for deadlock prevention. (6%)

3. Consider a single processor system with five jobs (i.e., J1, J2, J3, J4 and J5) to be executed:

Job	Burst Time
J1	7
J2	5
J3	2
J4	6
J5	3

Assume that these jobs arrive in the order J1, J2, J3, J4, J5. Please answer the following questions using round-robin scheduling with quantum = 3.

- (a) Draw a Gantt chart illustrating the execution of these jobs. (5%)
(b) What is the turnaround time of each job? (5%)
(c) What is the waiting time of each job? (5%)

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4.

Consider the following snapshot of a system with four processes (i.e., P1, P2, P3 and P4) and five resource types (i.e., A, B, C, D and E):

Processes	Allocation (A,B,C,D,E)	Max (A,B,C,D,E)	Available (A,B,C,D,E)
P1	(1,0,2,1,1)	(1,1,2,1,2)	(0,0,X,1,1)
P2	(2,0,1,1,0)	(2,2,2,1,0)	
P3	(1,1,0,1,0)	(2,1,3,1,0)	
P4	(1,1,1,1,0)	(1,1,2,2,1)	

Please answer the following questions based on the system snapshot provided above.

- (a) Show the content of the matrix *Need* used in the banker's algorithm. (4%)
- (b) What is the smallest value of X to keep the system in a safe state? Explain your answer to receive full credit. (9%)

5.

Consider a 32-bit OS that runs on a machine with 64MB of physical memory. The OS divides the 32-bit logical address space into pages. Each page is sized of 4KB. There are 4 methods for translating a virtual address to a physical address:

- (a) one-level page table
- (b) two-level page table (the first level page table has 256 entries; we only need the first level page table and first one of the second level page table to be saved in memory)
- (c) hashed page table (the range of the value returned by the hash function is between 0 and 27)
- (d) inverted page table.

Please calculate the memory space required for a process's page table in each method under the assumption that each entry in the page table is sized of 4 bytes. (16%)

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考試命題用紙

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6. Suppose the head of a moving-head disk with 200 tracks, numbered 0 to 199, is currently serving a request at track 100 and just finished a request track 110. The queue of the requests is kept in the FIFO order: 86, 117, 91, 150, 102. What is the total number of head movements needed to satisfy these requests for the following disk scheduling algorithms? (15%)
(a) FCFS (b) SSTF (c) SCAN (d) C-SCAN (e) LOOK (Please note that the head movements without gathering data are also included)

7. An IDE hard disk spins at 7200 RPM, has 2 MB internal cache, 5000 cylinders, 20 tracks per cylinder, 120 sectors per track, 512 bytes per sector.
(a) Calculate the disk size. (2%)
(b) Estimate the transfer rate in bytes second. (2%)
(c) What is the access time (in the scale of milliseconds) for reading a file with size 0.36865 MB under the assumption that seek time is 4 milliseconds? (2%)

8. In a demand-paging system with associative registers, it takes 2 milliseconds to serve a page fault. A memory reference takes 200 nanoseconds and finding a page-table entry in the associative register takes 20 nanoseconds, determine the effective access time for a 90% hit ratio and 10% page fault ratio. (4%)

9. Please define the difference among mutex, semaphore (implemented by using system calls block() and wakeup()), and monitor. (9%)