

淡江大學 95 學年度碩士班招生考試試題

86-1

系別：資訊工程學系

科目：作業系統

准帶項目請打「V」
簡單型計算機

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本試題雙面印製

- In a multi-level paging system, the length of a logical address is 32-bit and the page size is 4K bytes. Normally, a logical address is divided into two fields: a page number and a page offset. If the page table is too large, it is also paged. (25%)

 - How many fields will be divided for a logical address in this scheme? How many bits are contained in each of the fields? Why? (6%)
 - Draw a diagram to illustrate the translation from a logical address to its corresponding physical address. (5%)
 - What is the maximum number of memory frames required for the page table of a process? Why? (5%)
 - How many memory references are required for accessing an instruction in memory? Why? (4%)
 - Are there any techniques available to reduce the memory access time for fetching an instruction? Describe the technique in details, if available. (5%)
- Suppose that there are four frames allocated for a process in a virtual memory system. Consider the following page-reference string for this process: (20%)

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

How many page faults would occur for the following replacement algorithms? Show the places where the page replacements take place.

 - Optimal, and (10%)
 - Second-chance. (10%)
- Suppose that a disk drive has 5,000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 1143, and the previous request was at cylinder 3225. The queue of pending requests, in FIFO order, is

2186, 1740, 293, 1774, 890, 3150, 1022, 2750, 4320, 753, 1235, 3491

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms? Draw a diagram to illustrate the search path. (20%)

 - SSTF, and (10%)
 - LOOK. (10%)
- Consider a file system on a disk that has both logical and physical block sizes of 512 bytes. Assume that the information about each file is already in memory. For each of the three allocation strategies (contiguous, linked, and indexed) answer the following question: If we are currently at location block 25 (the last block accessed was block 25) and want to access logical block 87, how many physical blocks must be read from the disk? Justify your answer. (15%)

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5. A solution to the critical-section problem must satisfy three requirements. (20%)
- (a) What are these requirements? Explain each of these requirements in details. (10%)
- (b) The following algorithm is proposed trying to solve the critical-section problem for only 2 processes, P_0 and P_1 . Shared variables `flag[2]` of Boolean data type are initially set to false; i.e., `flag[0] = flag[1] = false`. If variable `flag[i]` is set to true, then process P_i is ready to enter its critical section. The algorithm for Process P_i is as follows: (where $i = 0$ or 1 , and $j = (i + 1) \% 2$)

```
do {
    flag[i] = true;
    while (flag[j]) ;
        critical section
    flag[i] = false;
    remainder section
} while (1);
```

Does the above algorithm satisfy all three requirements? Justify your answer. (10%)