

國立臺灣科技大學
九十學年度碩士班招生考試試題

系所組別：資訊管理系甲組
科目：計算機概論

1. (10%) Explain the difference between internal and external fragmentation in memory management.
2. (10%) Describe the concept of working set model in virtual memory management.
3. (10%) Consider the two-dimensional array A :

$\text{var } A: \text{array } [1..100] \text{ of array } [1..100] \text{ of integer};$

where $A[1][1]$ is at location 200, in a paged memory system with pages of size 200. A small program is in page 0 (location 0-199) for manipulating the matrix, thus every instruction fetch will be from page 0.

For three page frames, how many page faults are generated by the following array initialization loops, using LRU (least recently used) replacement, and assuming page frame 1 has the program in it, and the other two are initially empty.

- a. $\text{for } j := 1 \text{ to } 100 \text{ do}$
 $\quad \text{for } i := 1 \text{ to } 100 \text{ do}$
 $\quad \quad A[i][j] := 0;$
 - b. $\text{for } i := 1 \text{ to } 100 \text{ do}$
 $\quad \text{for } j := 1 \text{ to } 100 \text{ do}$
 $\quad \quad A[i][j] := 0;$
4. (10%) Assume that a linked representation is given for a binary tree. Give an algorithm to count the number of leaf nodes in a binary tree. What is its computing time?
 5. (10%) To illustrate how the asymptotic notation can be used to rank the efficiency of algorithms, use the relations " $\subset$ " and " $=$ " to put the orders of the following functions into a sequence, where ϵ is an arbitrary real constant, $0 < \epsilon < 1$.

$$n \log n \quad n^8 \quad n^{1+\epsilon} \quad (1+\epsilon)^n \quad n^2 / \log n \quad (n^2 - n + 1)^4$$

Do not use the symbol " $\subseteq$ ".



173

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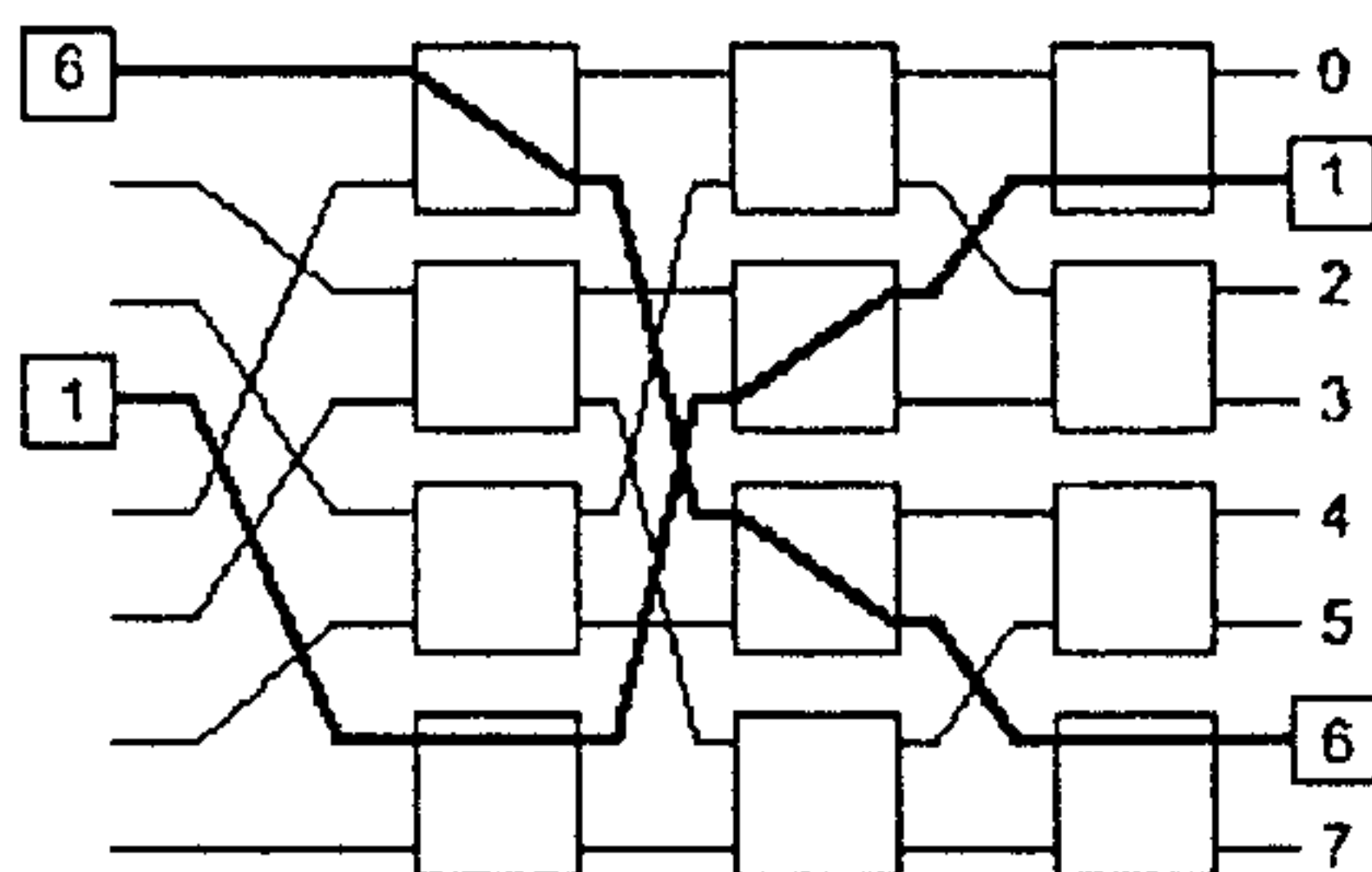
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6. (10%) A man has 5 objects. He can put the whole, part, or none of every object into a bag. The goal is to carry the objects in the bag which have the maximum profit with weight constraint. The weights and profits of the five objects are listed as follows:

Object	1	2	3	4	5	
Weight	10	20	30	40	50	
Profit		30	20	60	60	80

What is the maximum profit we can obtain if the bag can contain at most weight 100? What objects and how much of them should be put into the bag? (For example: We can put 50% of object 2, 100% of object 4, and 100% of object 5 with the total weight = 100. Thus, we have profit $20 \times 50\% + 60 \times 100\% + 80 \times 100\% = 150$)

7. (10%) State the algorithm of searching for the shortest paths of single-source-all-destination on a graph with N nodes when using cost adjacency matrix.
8. (10%) What is the transmitted data under the condition that the data $M(x)$ is 1010100 and the generating polynomial $G(x)$ is 1101 when CRC is used?
9. (10%) Give two main characteristics of physical layer, data link layer, and network layer.
10. (10%) The following is an 8-input Banyan switch.
- (1) State the rule about how to switch from an input to an output in this switch.
 - (2) What is collision?



174