

元智大學 100 學年度研究所 碩士班 招生試題卷

系(所)別： 電機工程學系碩  
士班

組別： 計算機工程組

科目： 計算機與資訊結構

用紙第 1 頁共 2 頁

●不可使用電子計算機

1. (10%) Convert the following decimal numbers to hexadecimal: (各 5%)
  - (a) 1411
  - (b) 12.13
  
2. (5%) (a) A computer uses isolated I/O addressing. Its memory has 1024 words. If each controller has 16 registers, how many controllers can be accessed by this computer?  
(5%) (b) A computer uses memory-mapped I/O addressing. The address bus uses 10 lines (10 bits). If memory is made up of 1000 words, how many four-register controllers can be accessed by the computer?
  
3. (10%) I/O devices operate at much slower speeds than the CPU, and therefore the operation of the CPU must be somehow synchronized with the I/O devices. Please describe the three methods devised for this synchronization, respectively. Rank the efficiency of these methods and explain in detail.
  
4. (10%) A multiprogramming operating system uses paging. The available memory is 60 MB divided into 15 frames, each of 4 MB. The first program needs 13 MB. The second program needs 12 MB. The third program needs 27 MB. (各 2%)
  - (a) How many frames are used by the first program?
  - (b) How many frames are used by the second program?
  - (c) How many frames are used by the third program?
  - (d) How many frames are unused?
  - (e) What is the total memory wasted? (not including the memory lost in each frame)
  
5. (10%) A multiprogramming operating system uses an apportioning scheme and divides the 60 MB of available memory into four partitions of 10MB, 12MB, 18MB, and 20MB. The first program to be run needs 17 MB and occupies the third partition. The second program needs 8MB and occupies the first partition. The third program needs 10.5 MB and occupies the second partition. Finally, the fourth program needs 20 MB and occupies the fourth partition. What is the total memory used? What is the total memory wasted? What percentage of memory is wasted?  
(4%) (3%) (3%)

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6. (10%) Doubly linked list and single linked list
- (a) (5%) Compare the differences of insertion methods for both data structures
  - (b) (5%) Compare the differences of delete methods for both data structures
7. (10%) Draw the expression tree and find the infix and postfix expression for the following prefix expression:
- \*+AB-\*CD/EF**
8. (10%) Determine the big-O notation for the following:
- (a) (5%)  $5n^2 + n^{3/2}$
  - (b) (5%) If the efficiency of the algorithm **doIt(...)** can be expressed as  $O(n)=n^2$ , calculate the efficiency of the following program segment:  

```
for (i=1; i<n; i*=2)
doIt(...);
```
9. (10%) The following C program is to destroy a binary tree (free the memory)
- ```
void destroy(NODE *root)
{
    if(root != NULL){
        destroy(root->left);
        destroy(root->right);
        free(root);
    }
}
```
- (a) (5%) Which type is the traversal of the tree? (preorder, inorder, or postorder)
  - (b) (5%) Will it be still correct if we use the other two traversals to implement this program? Explain it.
10. (10%) Heap sort and quick sort
- (a) (6 %) Describe the heap sort and quick sort
  - (b) (4 %) What is the efficiency of the heap sort and quick sort? (Use big-O notation and with brief explanations)