銘傳大學 99 學年度研究所碩士班招生考試

資訊工程學系碩士班與資訊傳播工程學系碩士班

第三節

計算機概論(含資料結構、作業系統)試題

(第 1 頁共 2 頁)(限用答案本作答) □可使用計算機 □不可使用計算機

I. Choose the best answer: (10%)

1.( ) Which one in the following data structures is best for the CPU scheduling of "high-priority job first" for operating system to pick up the highest priority job into CPU: (A). binary search tree (B). heap (C). stack (D). queue.

2.( ) Which one of the following search methods' time complexity is usually nothing to do with the number of input data: (A). binary search (B). sequential search (C). hash (D). depth first search.

3.( ) If we have a two-dimensional array *b* (i.e. In programming language C, we declare: "**unsigned int *b*[10][10];**"). The memory address of *b*[0][0] is decimal 5678. Then, the memory address of *b*[5][6] will be : (A). 5902 (B). 5938 (C). 5734 (D). 5743.

4.( ) Which one of the following operating systems is open source software? (A). Linux (B). Mac OS X Leopard (C). XP (D). None of the above.

5.( ) Which one of the following description about virtual machine is not correct? (A). VMware is a commercial software of virtual machine. (B). running Java program needs virtual machine. (C). virtual machine must be installed on a system with multiple CPUs. (D). virtual machine is a useful tool to develop and test a new operating system.

II. Please briefly describe the following terms: (40%)

1. semaphore, 2. dynamic linking, 3. cache, 4. thrashing, 5. interrupt vector,
6. circular queue, 7. binary heap, 8. red-black tree, 9. minimum spanning tree, 10. multi-core system.

III. Please give your idea about the major differences between paging and segmentation schemes in memory management. (10%)

IV. Key-indexed counting is a sorting algorithm, which can sort data in linear-time, by taking advantage of special property of keys, provided that the range of distinct key values is within a constant factor of the file size. That's to say, sort a file of `maxN` items whose keys are distinct integers between 0 and `M-1`. Please furnish the following program for key-index counting to sort in linear time if `M` is much smaller than `maxN`.
Please also give the final results of arrays `cnt[ ]` and `a[ ]` after the program running with initial `a[10]={3, 0, 0, 1, 2, 2, 0, 3, 4, 0}` in case of `f` is 0 and `r` is 9 (i.e. `maxN-1`) . (15%)

```
void distcount(int a[], int f, int r)
  { int i, j, cnt[M];
    int b[maxN];
      for (j=0; j < M; j++) cnt[j] = 0;
      for (i=f; i <= r; i++) _____;
      for (j=1; j < M; j++) _____;
      for (i=f; i <= r; i++) _____;
      for (i=f; i <= r; i++) a[i] = b[i];
  }
```

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V. **Proof:** For any nonempty binary tree T, if n_0 is the number of leaf nodes and n_2 the number of nodes of degree 2, then $n_0=n_2+1$. (5%)

VI. Please prove the number of "printf" shown in the output of the following recursive program of **tower of hanoi** is 2^N-1 if the initial value of "diskleft" is *N*. (10%)

```
void movedisk(int diskleft, int from, int temp, int to)
{
    if(diskleft > 0){
        movedisk(diskleft-1, from, to, temp);
        printf("move disk %d from tower %d to tower %d\n", diskleft, from, to);
        movedisk(diskleft-1, temp, from, to);
    }
}
```

VII. Which one in the following two program segments has better performance if each program has only a single frame in memory to store the integer array a? A single frame can store 512 elements of "int" type data. Show your performance evaluation by the number of page faults happened in each program execution. (10%)

Program segment 1:

```
int a[][]=new int[256][256];
for (int j = 0; j < a.length; j++)
    for (int i = 0; i < a.length; i++)
        a[i,j] = 0;
```

Program segment 2:

```
int a[][]=new int[256][256];
for (int i = 0; i < a.length; i++)
    for (int j = 0; j < a.length; j++)
        a[i,j] = 0;
```

試題結束

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