

國立中山大學 111 學年度

碩士班暨碩士在職專班招生考試試題

科目名稱：作業系統與資料結構【資工系碩士班甲組】

—作答注意事項—

考試時間：100 分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示，可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，請衡酌作答(不得另攜帶紙張)。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，後果由考生自負。
- 答案卷（卡）應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）入場。
- 試題及答案卷（卡）請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

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科目名稱：作業系統與資料結構【資工系碩士班甲組】

題號：434003

※本科目依簡章規定「不可以」使用計算機(問答申論題)

共 2 頁第 1 頁

INSTRUCTIONS: If any question is unclear or you believe some assumptions need to be made, state your assumptions clearly at the beginning of your answer.

1. What are printed by each of the following C program?

(a) (5%)

```
void f(int v[ ], int *w, int *x, int y[ ], int z[ ])
{
    w[2] += 4;
    printf("%d %d %d %d %d \n", v[0], w[2], x[5], *(y+3), z[2]);
}
int main( )
{
    int e[ ]={10,11,12,13,14,15,16,17,18,19,20};
    f(&e[2]+4, &e[2+4], e, e+4, &e[2]);
}
```

(b) (10%)

```
void g(char a[ ], int k, int m)
{
    if (k == m) {
        for (int i = 0; i <= m; i++) cout << a[i] << " ";
        cout << endl;
    }
    else
        for (int i = k; i <= m; i++) {
            swap(a[k], a[i]); // exchange
            g(a, k+1, m);
            swap(a[k], a[i]);
        }
}
int main( )
{
    char a[ ]="abcde";
    g(a, 0, 2);
}
```

2. (10%) Suppose four symbols A, B, C, D are input into a stack sequentially. Four PUSH operations and four POP operations are used for the stack. There are some sequences are impossible output from the all possible combinations of PUSH and POP. Please give the number of each impossible case with AXXX, BXXX, CXXX, DXXX separately.
3. (10%) The following numbers are input into an empty binary search tree sequentially: 3, 6, 4, 5, 2, 7, 1. And, then 3 is deleted from the tree. When a nonleaf node is deleted, its inorder successor will replace its position. Please draw the tree after the deletion of 3.
4. (a) (10%) If we use the heap sort method to sort 14, 4, 19, 2, 18, 7, 17, 9, 16, 13 into increasing order, the first phase is to build a maximum heap. Please draw the heap tree after the first phase finishes.
(b) (5%) The second phase of the heap sort is to output the solution. Please draw the heap tree after the first maximum is output and the heap is restored.
5. Given an i -node with ten direct blocks and three levels of indirect blocks and assuming that the sizes of a pointer and a block are, respectively, 8 bytes and 8 Kbytes, answer the following questions.

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- (a) (5%) How many blocks are needed for the smallest file?
- (b) (5%) How many blocks are needed for the largest file?
- 6. (10%) A computer whose processes have 4096 pages in their address spaces keeps its page tables in memory. The overhead required for reading a word from the page table is 500 nsec. To reduce this overhead, the computer has a TLB, which holds 128 (page, frame) pairs and can do a lookup in 50 nsec. What hit rate is needed to reduce the mean overhead to 100 nsec or less, *assuming that the page table is consulted only if there is a miss*?
- 7. (10%) A disk has 10000 cylinders, each with 10 tracks of 512 blocks. A seek takes 1 msec per cylinder moved. If no attempt is made to put the blocks of a file close to each other, two blocks that are logically consecutive (i.e., follow one another in the file) will require an average seek, which takes 5 msec. If, however, the operating system makes an attempt to cluster related blocks, the mean interblock distance can be reduced to 2 cylinders and the average seek time reduced to 500 microsec. How long does it take to read a 100 block file in both cases, if the rotational latency is 10 msec and the transfer time is 20 microsec per block?
- 8. (10%) A computer has 8 GB of RAM allocated in units of 4 KB. How many KB are needed if a bit map is used to keep track of free memory?
- 9. (10%) A machine has 48-bit virtual addresses and 32-bit physical addresses. Pages are 4 KB. How many entries are needed for the page table?