編號： 116

國立成功大學 104 學年度碩士班招生考試試題

系所組別：工程科學系乙組

考試科目：資料結構

考試日期：0212，節次：1

※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. *(10%)* Determine the Big-O as a function of *n* by estimating the number of times that the statement X is executed.

```
    Void Function (int n)
        {
            int r;
            r = 1;
            while (r < n )   {
                X; r = 2*r; }
        }
```

2. *(10%)*

   Complete the parts indicated by *XXX-1 and XXX-2* for stack operations

```
void add(int *top, element item)
{
 /* add an item to the global stack */
      if (*top >= MAX_STACK_SIZE-1)   {
            stack_full( );
            return;
      }
      stack[XXX-1] = item;
}

element delete(int *top)
{
 /* return the top element from the stack */
      if (*top == -1)
          return stack_empty( );   /* returns and error key */
      return stack[(XXX-2);
 ]
```

3. *(10%)* Please translate the following expressions.

   Infix to Postfix conversion: (a+b)/(c–d)*e+f/g

   Postfix to Infix conversion: abc*+de*-f+

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4. *(10%)* The Prim's algorithm is to find a MCST. Please answer (a) What is MCST? (b) Why is it called greedy algorithm?

5. *(15%)* On average, the time complexity of *Quicksort* is O(*n*log n*), but its worst case is O(n^2) which is greater than that of *Mergesort*. (a) Why we can call it "quick"? (b) Explain when the worst case happens.

6. *(15%)* Construct a *MAX Heap* by the order of the following input: *9、14、15、4、7、18、3、6、20.* You need to specify the method used, *top-down* or *bottom up*, before starting the construction.

7. *(15%) Mergesort* can be expressed by the recursive function *T(n) = 2*T(n/2)+O(n),* while *Quicksort* can be expressed by *T(n) = T(k)+T(n-k)+O(n), where* $1 \leqq k \leqq n-1$. (a)Explain the reason, (b) Derive the time complexity from the function for *Mergesort.*

8. *(15%)*
   (a) Write down the input and output for *Hash Function*.
   (b) To access a record (or data), we can use sequential search or direct access. Hashing is a compromise method between two approaches, why? (c) Linear probing and chaining are often used to handle the collision, Compare them.