

招生學年度	九十九	招生類別	碩士班
系所班別	資訊工程學系碩士班、資訊工程學系網路與多媒體科技碩士班		
科目	資料結構		
注意事項	本考科禁止使用掌上型計算機		

4. (35%) [Priority Queue]

- (a) What is Priority Queue? (3%)
- (b) Please take an application example to showcase the use of priority queue. (5%)
- (c) What is the time of insertion and deletion for a Priority Queue represented by an unordered linear list? In general, we use a Max (min) Heap to implement the Priority Queue. (5%)
- (d) What is a Max Heap? The ADT of MaxHeap and a definition of insertion function Insert() are shown in the following. (3%)
- (e) Please draw the heap after the insertion of an element with key value 21 into the heap shown in Figure 1 according to Insert(). (4%)
- (f) Please implement the deletion function Delete() in light of the function declaration in class MaxHeap. (15%)

```
template <class KeyType>
class MaxHeap : public MaxPQ<KeyType>
{
public:
    MaxHeap(int sz= DefaultSize);
    boolean IsFull();
    void Insert(Element<KeyType> item);
    boolean IsEmpty();
    Element<KeyType>* Delete(Element<KeyType>& x);
};
```

```
template <class Type>
void MaxHeap<Type>::Insert(const Element<Type>& x)
{
    if IsFull() { HeapFull(); return;}
    n++;
    for (int i= n; 1; ) {
        if (i== 1) break;
        if (x.key<= heap [i/2].key) break;
        heap[i]= heap[i/2];
        i/= 2;
    }
    heap[i]= x;
}
```

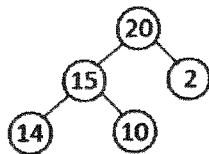


Figure 1.

5. (11%) [Sorting] Let n denote the input size. Please fill in the following cells (a)–(k) with suitable data.

Sorting method	Extra storage	Average case running time	Stable
Insertion	(a)	(b)	(c)
Merge	$\theta(n)$	$\theta(n \log n)$	(d)
Quick	(e)	(f)	(g)
Selection	(h)	(i)	Yes
Heap	(j)	(k)	No

6. (9%) [Quadratic Probing]

- (a) What is the clustering appearance in the linear probing? (3%)
- (b) Show the hash computation $h_i(x)$ of the quadratic probing. (3%)
- (c) Explain why the quadratic probing can mitigate the clustering in the linear probing. (3%)