**Interview Questions: Union–Find (ungraded)**

**总分：{TOTALPOINTS}**

**1.第 1 个问题**

**Social network connectivity. Given a social network containing n*n* members and a log file containing m*m* timestamps at which times pairs of members formed friendships, design an algorithm to determine the earliest time at which all members are connected (i.e., every member is a friend of a friend of a friend ... of a friend). Assume that the log file is sorted by timestamp and that friendship is an equivalence relation. The running time of your algorithm should be m \log n*m*log*n* or better and use extra space proportional to n*n*.**

***Note: these interview questions are ungraded and purely for your own enrichment. To get a hint, submit a solution.***

1

**Correct**

*Hint*: union−find.

**1/1 分**

**2.第 2 个问题**

**Union-find with specific canonical element. Add a method**find()**to the union-find data type so that**find(i)**returns the largest element in the connected component containing i*i*. The operations,**union()**,**connected()**, and**find()**should all take logarithmic time or better.**

**For example, if one of the connected components is \{1, 2, 6, 9\}{1,2,6,9}, then the**find()**method should return 99 for each of the four elements in the connected components.**

1

**Correct**

*Hint:* maintain an extra array to the weighted quick-union data structure that stores for each root i the large element in the connected component containing i.

**1/1 分**

**3.第 3 个问题**

**Successor with delete. Given a set of n*n* integers S = \{ 0, 1, ... , n-1 \}*S*={0,1,...,*n*−1} and a sequence of requests of the following form:**

* **Remove x*x* from S*S***
* **Find the *successor* of x*x*: the smallest y*y* in S*S* such that y \ge x*y*≥*x*.**

**design a data type so that all operations (except construction) take logarithmic time or better in the worst case.**

1

**Correct**

Hint: use the modification of the union−find data discussed in the previous question.