Assignment #3:
Due June 14
[Keep a copy of your work with you as we might not be able to return it by Exam I]

1. Show switch settings for the following output permutation in an 8×8 switch using the algorithm described in class: Show the settings for all switches. [3,5,7,8,6,2,1,4] The input permutation is [1,2,3,4,5,6,7,8] as usual.

2. Problem 4-5

3. Problem 4-6

4. 9.3-1

5. 9.3-8

6. The following problem is taken from the book by Tardos and Kleinberg: Given a complete binary tree with \( n = 2^d - 1 \) nodes for some positive integer \( d \). Each node \( u \) is associated with a number \( x_u \). A node \( v \) in the tree is a local minimum if \( x_v \) is less than the value associated with its neighbors (children or parent). You may assume that numbers associated with nodes are distinct (i.e. no two are equal). We want to determine a local minimum. The only operation allowed, in addition to comparisons, is to query a node for its value and this is counted as one operation. Design a divide-and-conquer algorithm, set up the corresponding recurrence relation and solve it to determine the complexity of your algorithm. The better the complexity the higher your score for this problem.

7. Challenge Problem #1: Do #6 if the graph is a rectangular grid graph.

8. Challenge Problem #2: 9-2