問答題：

1. (10%) Propose an algorithm to implement a queue using two stacks.

2. (8%) Convert a prefix expression -+*ABC/EF to an infix expression using a stack. Your answer should include step-by-step status of input, stack, and output.

3. (12%) The period of a string $p_1...p_n$ is the smallest $m > 0$ such that $p_1...p_{n-m} = p_{m+1}...p_n$. That is, removing the first m characters yields the same string as removing the last m characters. Propose an algorithm to compute the period of a length n string that runs in time $O(n)$.

4. (10%) Given a list of unsorted numbers, int *list*[n]. Write a program to sort the *list* into non-decreasing order by QuickSort. Assume that we always use the leftmost element in a (sub-)list as the pivot.

5. (10%) Illustrate how data changes while using mergesort to sort: {24, 4, 35, 1, 60, 12, 16, 52}.

6. (10%) Given 5 records: "Aarom", "Ana", "Donnie", "Tyriom", and "Monz". The key of each record is defined by the sum of the ASCII code of each character (ASCII of 'A' is 65 and 'a' is 97). Assume we have a 37-bucket table with one slot per bucket. Let's insert the 5 records into the bucket in sequence and in case of collision, we adopt open addressing strategy to handle the case. Please determine the bucket index of each record.

7. (5%) (a) Sketch the red-black tree by insert 8, 8, 12, 6, 9 into an empty red-black tree.
    (5%) (b) Sketch the red-black tree by insert 3, 4, 6, 5, 11, 10 into the red-black tree of part (a).

8. (8%) Find the adjacency matrix of the following directed graph.
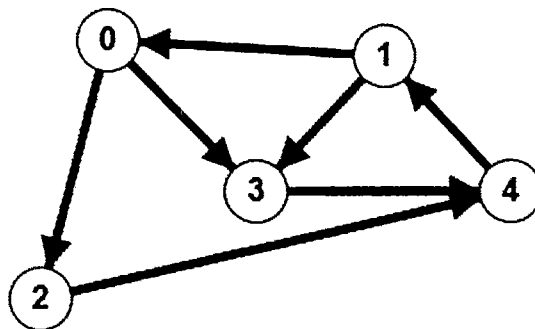
9. (14%) A *bipartite graph* G = (V, E) is an undirected graph whose vertices V can be partitioned into two disjoint sets U and W with the properties that no vertices in U are adjacent in G and no vertices in W are adjacent in G. Prove that every graph without cycles is bipartite.

10. (8%) Find the minimum cost spanning tree of the following graph.

注意：背面有試題