

CSCI2100B– Quiz 2

Name: _____

Student Number: _____

1. (20 points) The following procedure is designed to find all symmetric pairs in an array of pairs. Two pairs (a, b) and (c, d) are said to be symmetric if c is equal to b and a is equal to d. For example, (10, 20) and (20, 10) are symmetric. Given an array of pairs find all symmetric pairs in it. **Let's assume that the first elements of all pairs are distinct.**

Example: Input: arr[] = 11, 20, 30, 40, 5, 10, 40, 30, 10, 5

Output: (30, 40), (5, 10)

Complete the following incomplete procedure to accurately detect isomorphic strings:

```
findSymPairs(int arr[][2], int size)
{
    hm = HashMap(key=int, value=int) // The hash table uses integer as key value and each
    table entry stores an additional attribute of type interger.
    for (int i = 0; i < size; i++)
    {
        // First and second elements of current pair
        int first = arr[i][0];
        int sec = arr[i][1];

        find_result = hm.find(sec); // find_result is NIL if the hash map hm does not has an
        element with the key sec,
        // If the hm finds the element, then find_result is the value stored in the hash
        table entry

        if (find_result != NIL && find_result == first) {
            print(first, sec)
        }
        else {
            /* LINE TO INSERT */
        }
    }
}
```

What line shall be inserted at **/* LINE TO INSERT*/** in the procedure above? ()

- A. hm.insert(key=first, value=first);
- B. hm.insert(key=first, value=sec);
- C. hm.insert(key=sec, value=first);
- D. hm.insert(key=sec, value=sec);

2. (20 points) The following illustrates the steps of a sorting algorithm:

- 4, 3, 6, 2, 8, 1, 7, 9, 5
- 3, 2, 1, 4, 6, 8, 7, 9, 5
- 2, 1, 3, 4, 5, 6, 8, 7, 9
- 1, 2, 3, 4, 5, 6, 7, 8, 9

Identify the sorting algorithm represented by these steps. ()

- A. Insertion sort
- B. Merge sort
- C. Quick sort
- D. Radix sort

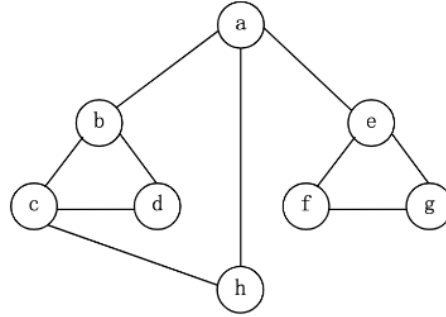


Figure 1: Problem 3.

3. (20 points) Given the undirected graph shown in Figure 1, which of the following is **NOT** a breadth-first search on this graph? ()
- A. h, c, a, b, d, e, g, f
 - B. e, a, f, g, b, h, c, d
 - C. d, b, c, a, h, e, f, g
 - D. a, b, c, d, h, e, f, g

Item number	weight	value
1	1	6
2	2	11
3	4	1
4	4	12

Table 1: Problem 5: 0-1 Knapsack problem items.

items/weight	0	1	2	3	4	5	6	7	8
{}	0	0	0	0	0	0	0	0	0
{1}	0	6	6	6	6	6	6	6	6
{1, 2}	0	6	11	17	17	17	17	17	17
{1, 2, 3}	0	6	11	17	17	17	17	18	18
{1, 2, 3, 4}	0	6	11	17	17	A	B	C	D

Table 2: Problem 5: 0-1 Knapsack DP Table.

4. You are working on a 0-1 knapsack problem with a capacity of 8. Table 1 shows the items available. Table 2 shows an incomplete dynamic programming table.
- (a) (20 points) Complete the DP table by finding the correct values for A, B, C and D.
 - (b) (20 points) What is the optimal solution for this problem? Write out the items to be put into the knapsack.