University of Nevada, Las Vegas Computer Science 477/677 Fall 2026

Assignment 6: Due Saturday November 14 2026 midnight

Follow our TA, Shareem Arjyal's (`arjyal@unlv.nevada.edu`) instructions on how to turn in the assignment.

Name:_____

You are permitted to work in groups, get help from others, read books, and use the internet.

However, note that these friends and books, and the internet, will not be able to help you on the tests. I have no way of checking whether someone else did your homework, but if they did, you will not be able to pass the exams.

A directed graph is called *acyclic* if it contains no self-loop and no cycle of positive length.

1. What is the meaning of *topological order* of a directed graph?

2. Let G be an acyclic directed graph of n vertices and m arcs. Describe, in words or pseudocode, an algorithm which finds the maximum number of vertices of any directed path in G.

3. Your company sells boating accessories. You need to choose a hash function for your set of customer files. Which of the following would be a better hash function?

   (a) The last four digits of the customer's social security number.

   (b) the last four digits of the customer's zip code.

   Why did you make that choice?

4. If separate chaining is used to resolve collisions in a hash table of size m which stores n items, Assume that the hash values of the items are chosen inpendently at random. The probability that a given place

has exactly k items is given by the Poisson distibution. If $m = 100$ and $n = 200$, the average number of items in a place is 2. Approximately how many places are expected to have exactly 2 items? Choose from the following list.

100

55

45

27

21

13

5. You are trying to construct a cuckoo hash table of size 10, where each of the 9 names listed below has two possible hash values, as indicated in the array. Can you construct that table such that no two names are assigned the same hash value? Construct the table, or show that it can't be done by using Hall's marriage theorem.

	h1	h2
Ann	0	3
Bob	1	3
Ted	6	8
Sue	3	6
Gus	2	7
Cal	4	7
Dan	1	9
Sal	6	9
Eve	5	8

6. A 3-dimensional $9 \times 7 \times 10$ rectangular array A is stored in main memory in row major order, and its base address is 8192. Each item of A takes one word of main memory, that is, one addressed location. Find the address of A[4][5][2].

7. Write, in correct C++ code, a dynamic programming algorithm for another version of the coin-row problem. Assume that a sequence of positive numbers $X[N]$ is given, where $X[i]$ is the value of the i^{th} coin in the row. Find the maximum total value of any subset of the coins subject to the restriction that no two coins which are either adjacent or have just one coin between them can be in the subset. For example, if the subset contains the first coin, it cannot contain the second or the third coin.

8. Use Graham Scan to find the convex hull of the set of points illustrated in the figure below. To make things easier for the grader, let G be the pivot, and sort the other points by the slope of the line segment from G to the point. Do not erase deleted lines.

