

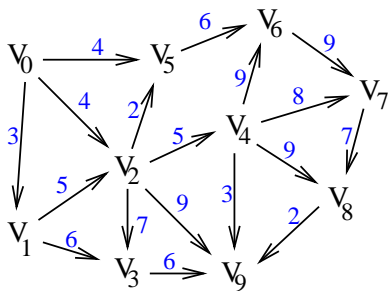
University of Nevada, Las Vegas Computer Science 477/677 Spring 2019

Assignment 4: Due Monday April 1, 2019

Name: \_\_\_\_\_

You are permitted to work in groups, get help from others, read books, and use the internet. But the handwriting on this document must be your own. Print out the document, staple, and fill in the answers. You may attach extra sheets. Turn in the pages to the graduate assistant at the beginning of class, March 6.

1. Consider the weighted dag  $G$  shown below.



Solve the single source minimum path problem for  $G$ , where  $V_0$  is the start vertex. Your answer should consist of two arrays, one which shows the minimum cost of a path to each  $V_i$ , and the other of which gives the back pointers.

2. Consider the function `george(int n)` computed by the following recursive C++ code.

```
int george(int n)
{
    assert(n >= 0);
    if (n < 2) return 1;
    else return 2*george((n+1)/2)+2*george(n/2)+2*george((n-1)/2)+2*george(n/2-1);
}
```

- (a) Use the master theorem to compute the time complexity of the above code.

(b) Design a dynamic programming algorithm to compute `george(n)` for any given `n`. You do not have to write C++ code. The time complexity of your algorithm should be  $\Theta(n)$ .

(c) Design a memoization algorithm to compute `george(n)` for any given `n`. You do not have to write C++ code. This algorithm should be much faster than the dynamic programming algorithm. What is its time complexity?

3. Write pseudocode for the Floyd-Warshall Algorithm.