

CSUS
COLLEGE OF ENGINEERING AND COMPUTER SCIENCE
Department of Computer Science

Section _____
Name _____

CSc 130

Jinsong Ouyang

DATA STRUCTURES AND ALGORITHM ANALYSIS Final

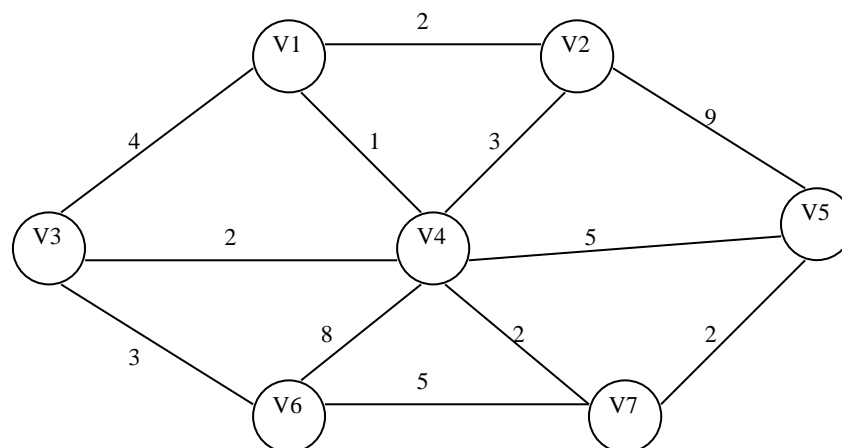
Total Time – 120 Minutes
Closed Book – Closed Notes

Total: 100

I. (30%) Graph

Part I (15 %)

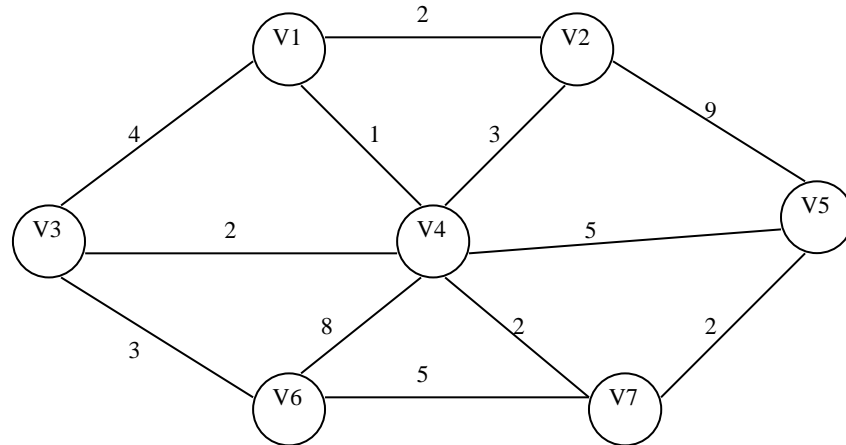
Given the following network topology, fill out the table for constructing the least-cost paths to all network destinations from V3.



V	Known	Dv	Pv
V1			
V2			
V3			
V4			
V5			
V6			
V7			

Part II (15 %)

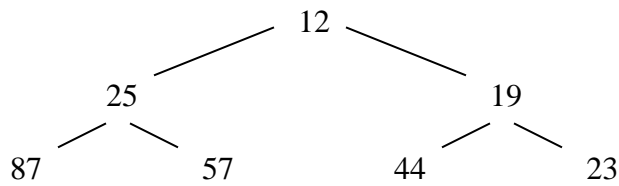
Using V1 as the starting point, use Prim's algorithm to fill out the table and draw the minimum spanning tree (MST).



V	Known	Dv	Pv
V1			
V2			
V3			
V4			
V5			
V6			
V7			

II. (20 %) Heap

A. (5) Show the steps to add the value “16” to the following heap:



B. (5) How can the given binary heap including “16” be represented in an array?

0	1	2	3	4	5	6	7	8

C. (10) Perform heapsort within the same array including “16” (without using additional array).

	0	1	2	3	4	5	6	7	8
Original array									
After delete 12									
After delete 16									
After delete 19									
After delete 23									
After delete 25									
After delete 44									
After delete 57									
After delete 87									

- III. Write pseudocode for the mergesort algorithm (10%) Explain how you figure out the time complexity of the “conquer” part of the code? (5%)

- IV. Write pseudocode for the quicksort algorithm (10%) Accordingly to the algorithm, show how you select a pivot and do the **partitioning** till you get S1 and S2 (**only for the top level**) (5%) Explain how you figure out the time complexity of the **partitioning** of an array of size N? (5%)

8	1	4	9	6	3	5	2	7	0
---	---	---	---	---	---	---	---	---	---

- V. Given a hash table which has 10 slots $[0, 1, 2, \dots, 9]$ and hash function $h(x) = x \bmod 10$, insert the sequence of numbers, $\{6, 16, 26, 36, 56, 76, 25, 86\}$, into the hash table using separate chaining (5%) and double hashing technique with $h_2(x) = 7 - (x \bmod 7)$ (10%) respectively.

