EL9343 Homework 11

(Due Apr 29th, 2022)

No late assignments accepted

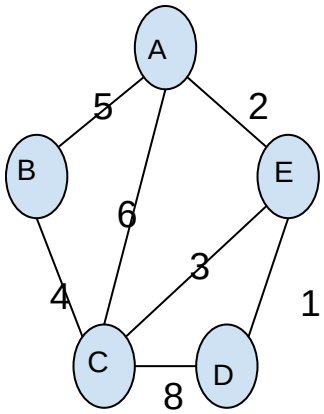
All problem/exercise numbers are for the third edition of CLRS text book

---

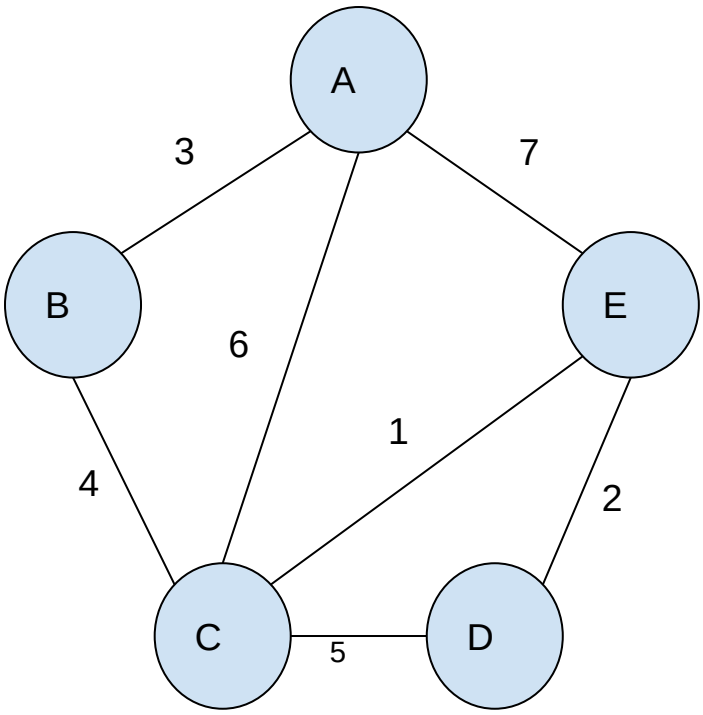
1. Design a greedy algorithm for arranging the queuing order in a supermarket. Suppose there are n customers come to the counter at the same time, noted as $c_1, c_2, \dots, c_n$, the time to service i-th customer is $s_i, i = 1,2 \dots n$, and the absolute time to finish i-th customer is $T_i, i = 1,2 \dots n$. Your goal is to decide a queuing order of n customers to minimize the average completion time(waiting time + service time) of all n customers, that is, to minimize $\frac{1}{n}\sum_{i=1}^{n} T_i$. For example, there are two customers, $c_1, and\ c_2$ with service time $s_1 = 7, and\ s_2 = 3$, if $c_1\ is\ served\ before\ c_2$, then $T_1 = 7, T_2 = 10$, average completion time= $(7+10)/2$=8.5; If $c_2\ is\ served\ before\ c_1$, then $T_1 = 10, T_2 = 3$, average completion time= $(3+10)/2$=6.5.
   (1) Provide an algorithm to solving this issue.
   (2) Prove your algorithm has the greedy choice property and optimal substructure.
   (3) Justify the running time of your algorithm.

2. How many bits are required to encode the message "aaabccxxxyyyyzz" using Huffman Codes?

3. Demonstrate Prim's algorithm for the given undirected weighted graph. (Use A as the source.)



4. If we run Kruskal's algorithm for the given graph, what will be the sequence in which edges are added to the MST?


A
3
7
B
E
6
1
4
2
C
5
D