

CSE 100 Final Exam, Spring 2021 - Harjot Grewal

By completing this exam, I acknowledge and confirm that I will not give or receive any unauthorized assistance on this examination. I will conduct myself within the guidelines of the university academic integrity guidelines.

- 1) a) True m) True
- b) False n) True
- c) False o) False
- d) True
- e) True
- f) True
- g) True
- h) False
- i) True
- j) True
- k) False
- l) True

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2) a) Heap Sort and Merge Sort

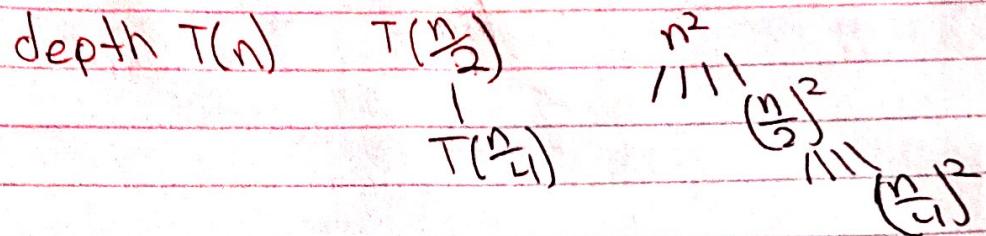
b) BFS has the shortest path

c) Dijkstra's is the fastest

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3) Recurrence: $T(n) \leq 4T(\frac{n}{2}) + \Theta(n^2)$



$$4\left(\frac{n}{2}\right)^2 = 4\left(\frac{n^2}{4}\right) = n^2$$

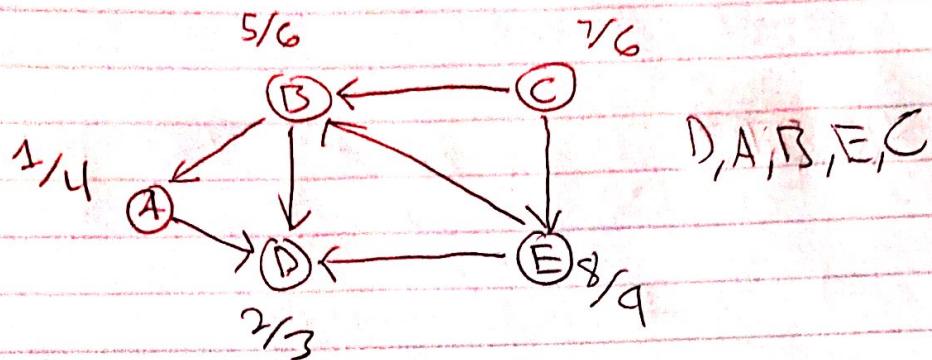
$$16\left(\frac{n}{4}\right)^2 = 16\left(\frac{n^2}{16}\right) = n^2 \quad \log_2(n) = \text{depth}$$

Total work: $\sum_{i=0}^{\log(n)} n^2 = \Theta(n^2 \log(n))$

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4)

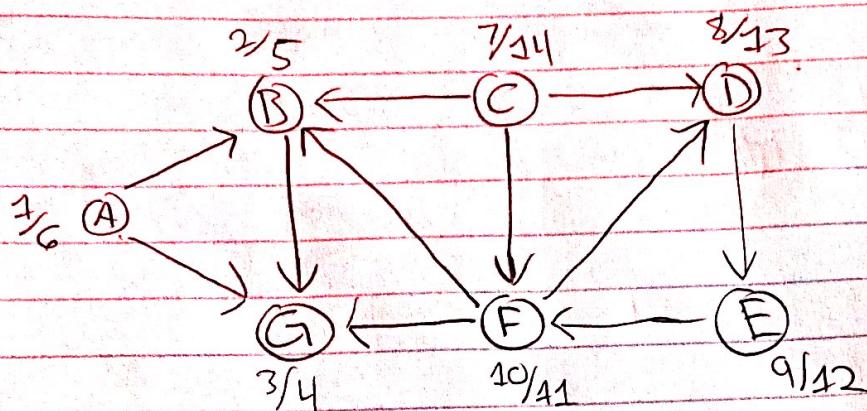


D, A, B, E, C

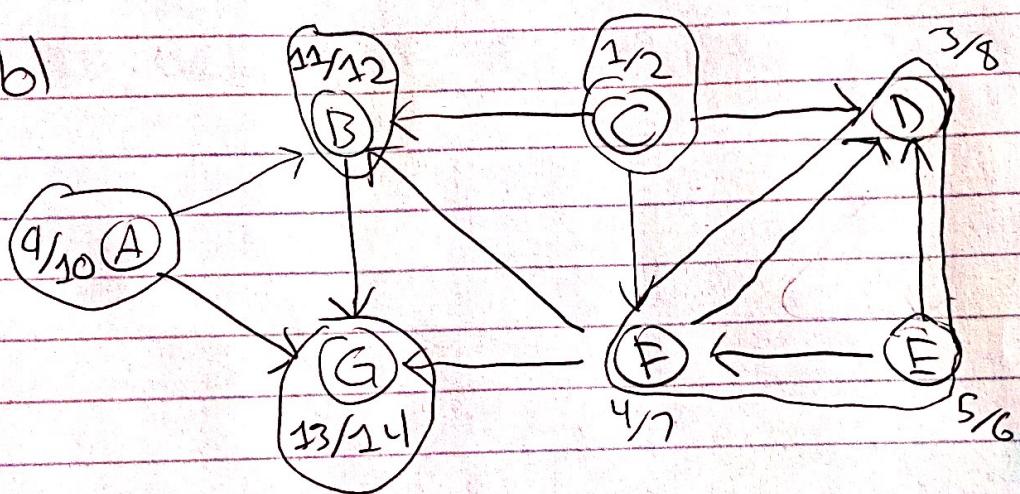
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5) a)



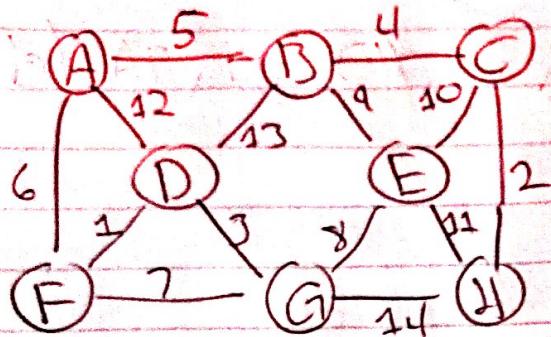
b)



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6)

- a) DF, CH, DG, BC, AB, AF, GE



- b) AB, BC, CH, AF, DF, DG, GE

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Textbook: 631-633

7) a) Running Times of Lines 2 & 3: $O(V)$

b) Running Time Line 4: $O(E \log E)$

c) Running Time Line 5-8: $O(E \log V)$

$$\begin{aligned} O(1) + O(|V|) + O(|E|) + O(|E| \alpha |V|) + O(1) \\ \Rightarrow O(|V|) + (|E| + |E| \alpha |V|) \Rightarrow O(V) \end{aligned}$$

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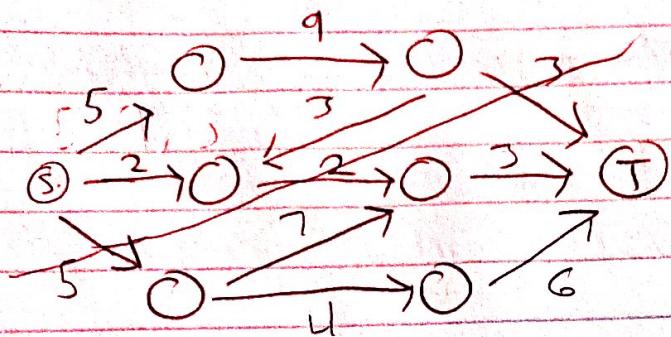
8)

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- Q) No this does not satisfy the greedy choice, meaning the algorithm is wrong. A counterexample would be to start from the beginning. This would prevent the algorithm from repeating steps & end sooner.

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10)



5, 9, 3

5, 9, 3, 2, 3

5, 4, 6
5, 7, 3

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71) a) Using a procedure similar to Print-LCS

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b) LCS

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12) Karger's Algorithm