

CS/CPE590: Algorithms

Spring 2023

Assignment5

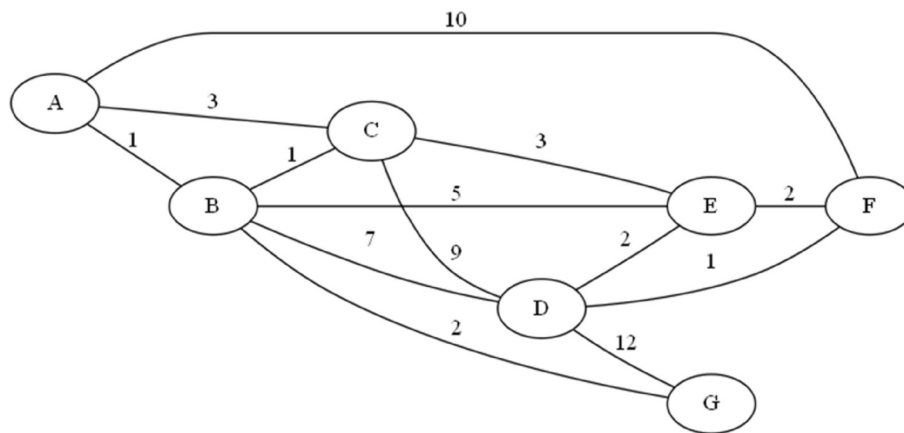
Greedy Algorithms

1. (a) Construct a Huffman tree (variable-length encoding) for the following [10 points]:

Symbol	A	B	C	D	E
Frequency	40	10	20	15	15

- (b) Encode ABACABAD using the tree you generated for (a). [5 points]
(c) Decode 100010111001010 using the tree you generated for (a). [5 points]
(d) What compression gain (percentage of improvement) do we get by using Huffman encoding (variable-length encoding) instead of a fixed-length encoding scheme? Draw the tree for the fixed-length encoding. [5+10=15 points]

2. Use Dijkstra's algorithm to find the shortest path between vertices A and F. (Start at A, end at F). Show all the steps of your work. [15 points]



3. (50 points) Implement a C++ program to apply Dijkstra's shortest path algorithm on a weighted graph. Please consider the graph above as input to your program (with A as the source vertex). Your program should work for both directed and undirected graphs and print the distance of the shortest path of all the vertices. Follow the provided template.

Remarks:

- The assignment has to be completed individually. No collaboration is allowed between students. No code from online resources is allowed to be used. Any sign of collaboration or use of online materials will result in a 0 and be reported to the Graduate Academic Integrity Board. You have to strictly follow the provided template. The late submission policy is applicable to the assignment as specified in the course syllabus.
- You have to submit a report containing your solutions to problems 1 and 2 as a pdf file.
- For problem-3, you have to maintain the provided template strictly!
- You have to make sure your program works as expected in the following online compiler:
https://www.onlinegdb.com/online_c++_compiler.
- **Submit a zip file containing your report(.pdf) file and code(.cpp) file.**