

Boğaziçi University, Dept. of Computer Engineering

CMPE 250, DATA STRUCTURES AND ALGORITHMS

Spring 2012, Midterm 1

Name: _____

Student ID: _____

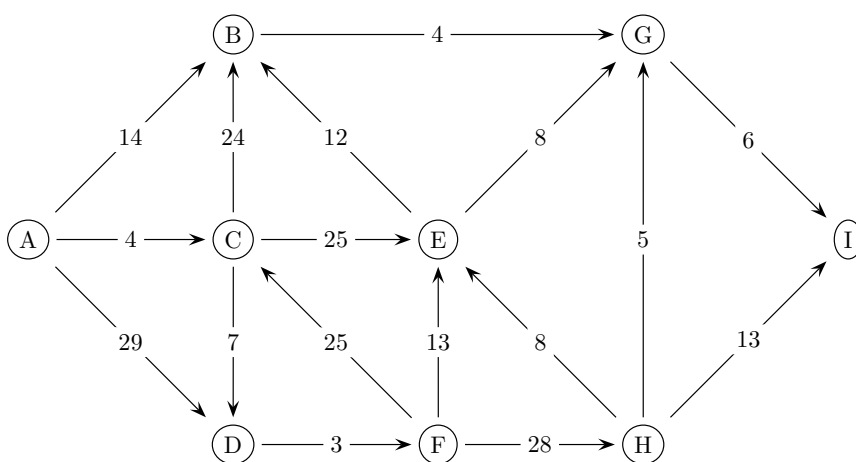
Signature: _____

- Please print your name and student ID number and write your signature to indicate that you accept the University honour code.
- During this examination, you may not use any notes or books.
- Read each question carefully and **WRITE CLEARLY**. Unreadable answers will not get any credit.
- For each question you do not know the answer and leave blank, you can get %10 of the points, if you write only "I don't know the answer but I promise to think about this question and learn its solution".
- There are **5** questions. Point values are given in parentheses.
- You have **120 minutes** to do all the problems.

Q	1	2	3	4	5	Total
Score						
Max	20	20	20	20	20	100

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- Run Dijkstra's algorithm on the weighted digraph below, starting at vertex A.



- List the vertices in the order in which the vertices are dequeued (for the first time) from the priority queue and give the length of the shortest path from A.

vertex: A C _____
 distance: 0 4 _____

- Draw the edges in the shortest path tree with thick lines in the figure above.

(20 points)

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2. Show the result of inserting 10, 12, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 13, 2 into a initially empty ternary heap one at a time. In a ternary heap, each node has 3 children. *(20 points)*

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3. (a) Give the pseudo-code of an algorithm to decide whether a given directed graph is acyclic.
- (b) Explain how to print out a cycle, if the graph is found to be cyclic. No pseudo-code is necessary, just briefly explain your idea in a few sentences. (Don't use breadth first or depth first search)

(20 points)

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4. (a) Assume that `percolate_up(hole)` and `percolate_down(hole)` functions are given. Using one (or both) of these functions, write the pseudocode for constructing a binary heap from a given array of N numbers.
- (b) Derive the computational complexity of constructing a binary heap using this method. [Hint: You should count the total distance of each node in the complete binary tree to the leaves.]

(20 points)

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5. C++

(20 points)