

Course Title: Data Structures & Algorithms Analysis
Date: 20/05/2012
No. of Questions: 5 Questions
Time: 2 hours
Using Calculator (No)

University of Palestine



Final Exam
2nd semester 2011/2012
Total Grade: 50

Instructor Name: Mr. Ahmed Al Astal
Student No.: _____
Student Name: _____
College Name: IT, SWE
Dep. / Specialist: _____
Using Dictionary (No)

First Question

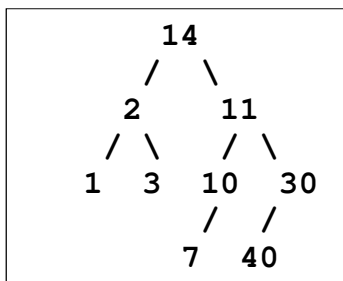
No. of Branches (2)

(5/50)

Q1B1

(5/7)

Here is a small binary tree:



- A. Circle all the leaves. Put a square box around the root. Draw a star around each ancestor of the node that contains 10.
- B. Write the order of the nodes visited in :
- An in-order traversal
 - A pre-order traversal
 - A post-order traversal:

Q1 B2

(2/7)

Explain why the case where node r has a right child but not a left child was not considered in the description of down-heap bubbling.

Second Question

No. of Branches (1)

(10/50)

Q2 B1

(10/10)

Choose the best Answer:

- In the tree in the box at Q1B1. How many of the nodes have at least one sibling?
 - 5.
 - 6
 - 7.
 - 8.
 - 9
- In the tree in the box at Q1B1, How many descendants does the root have?
 - 0
 - 2
 - 4
 - 8
- What is the minimum number of nodes in a full binary tree with depth 3?
 - 3
 - 4
 - 8
 - 15
- Select the one FALSE statement about binary trees:
 - Every binary tree has at least one node.
 - Every non-empty tree has exactly one root node.
 - Every node has at most two children.
 - Every non-root node has exactly one parent.

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Using Dictionary (No)

- 5) Consider the node of a complete binary tree whose value is stored in $\text{data}[i]$ for an array implementation. If this node has a right child, where will the right child's value be stored?
- a. $\text{data}[i+1]$
 - b. $\text{data}[i+2]$
 - c. $\text{data}[2*i + 2]$
 - d. $\text{data}[2*i + 1]$
- 6) What additional requirement is placed on an array, so that binary search may be used to locate an entry?
- a) The array elements must form a heap.
 - b) The array must have at least 2 entries.
 - c) The array must be sorted.
 - d) The array's size must be a power of two.
- 7) What is the best definition of a collision in a hash table?
- a) Two entries are identical except for their keys.
 - b) Two entries with different data have the exact same key.
 - c) Two entries with different keys have the same exact hash value.
 - d) Two entries with the exact same key have different hash values.
- 8) Selectionsort and quicksort both fall into the same category of sorting algorithms. What is this category?
- a) $O(n \log n)$ sorts
 - b) Divide-and-conquer sorts
 - c) Interchange sorts
 - d) Average time is quadratic.
- 9) When is insertionsort a good choice for sorting an array?
- a) Each component of the array requires a large amount of memory.
 - b) Each component of the array requires a small amount of memory.
 - c) The array has only a few items out of place.
 - d) The processor speed is fast.
- 10) Mergesort makes two recursive calls. Which statement is true after these recursive calls finish, but before the merge step?
- a) The array elements form a heap.
 - b) Elements in each half of the array are sorted amongst themselves.
 - c) Elements in the first half of the array are less than or equal to elements in the second half of the array.
 - d) None of the above.

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Third Question	No. of Branches (1)	(7/50)
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Q3B2 **(7/7)**

a. Show the result of inserting 3, 1, 4, 6, 9, 2, 5, 7 into an initially empty Heap.
b. Show the result of Removing Min.

Fourth Question	No. of Branches (2)	(13/50)
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Q4 B1 **(7/13)**

Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function $h(x) = x \text{ mod } 10$, show the resulting:

a. Separate chaining hash table.
b. Hash table using linear probing.
c. Hash table using quadratic probing.

<u>Q4 B1</u>		<u>(6/13)</u>
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Give a pseudo-code description of an insertion into a hash table that uses quadratic probing to resolve collisions,

Fifth Question	No. of Branches (2)	(13/50)
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Q5B1 **(6/13)**

Here is an array of ten integers:
5 3 8 9 1 7 0 2 6 4
Use Binary search to find the number 6.

<u>Q5B2</u>		<u>(7/13)</u>
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Here is an array of ten integers:
5 3 8 9 1 7 0 2 6 4
Sort this array using either quick sort or merg sort.

End of Questions
Good Luck