CSE 7350/5350 **Review Quiz** **(Updated Jan 2005)**
Spring 2005 **(Sample Questions)**

Discrete Mathematics/Data Structures

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Part A(60 Minutes) CLOSED BOOK

A1(2 points each) Give one or two sentence descriptions of each of the following terms from discrete mathematics and /or data structures in the space provided.

1.Stack An abstract data type which serves as a collection of data. A stack is used by pushing data into the structure and then popping data off.

2. One-to-one mapping refers to the concept of having a system in which each item/ input has linked to exactly one item/output

3,. Binary search tree is a data structure composed of sorted nodes which may have, at most, two children nodes. When traversing a BST, moving to the left of a node moves to a node with a lesser value than the current node, and moving to the right moves to a node with a greater value

4. Transitive relation refers to the idealogy where in a set of data, if an item ‘a’ is related to item ‘b’ and item ‘b’ is related to item ‘c’, then ‘a’ is also related to ‘c’

5. Hash table is a data structure which utilizes a hash function to compute the array index for a given key's value by hashing the key

6. Asymptotic notation are languages that allow for the analysis of an algorithm's running time by identifying its behavior as the input size increases

7. Monotonic function a function which is either entirely nonincreasing or nondecreasing. This function's derivative does not change sign.

A2. (2 points each): For each of the description below give the notation that corresponds as shown in the example.

0. (Example) The product 1 x 2 x 3 x 4 ....x n — n!

1. The sum of $y_1+y_2+y_3+ .....+ y_n$ — ∑ yn
2. The cartesian product of sets A and B — A x B
3. The least integer greater than or equal to x — ⌈x⌉
4. x is an element of set X — x ∈ X
5. Set A union set B — A ∪ B
6. Power set of set A — P(A)

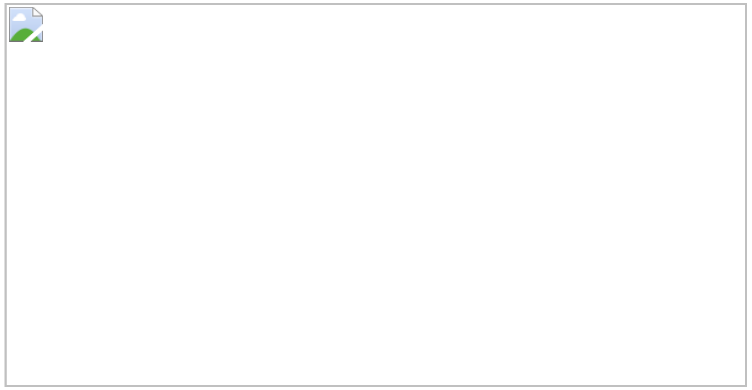
7. p implies q ___p -> q___

A3 (16 points): Fill in the time and space complexity for each of the following sorting methods as shown for bubble sort.

For space complexity indicate either that the solution is "in place" or indicate how much space is needed (e.g. 2n + O(1)).

	Sorting Time WORST CASE	Complexity BEST CASE	[# comparison] AVERAGE CASE	SORTING SPACE COMPLEXITY
Bubble sort	$O(n^2)$	O(n)	$O(n^2)$	In -place
Insertion sort				
Tree sort				
Binary search tree with inorder traversal sort				
Heap Sort				

A4. (12 points) Give the following traversals for the following binary tree.



PRE-ORDER ____

IN-ORDER ____

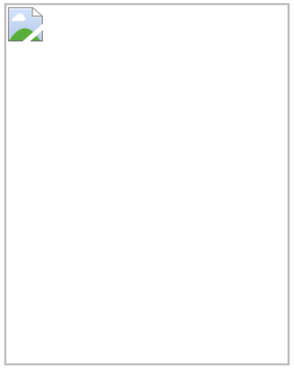
POST-ORDER ____

A5.(12 points) For the graph G represented by the following adjacency lists of vertices:

a: ® b, f, g
b: ® a, c, d, f
c: ® b, d, e
d: ® b, c, e, f, g
e: ® c, d, g
f: ® a, b, d, g
g: ® a, d, e, f

(i) [3 points] give the adjacency matrix for G,

(ii) [3 points] draw the graph G (as a planar graph if possible).



(iii) [6 points] For the following graph diagrams write down the answers to each question in the space provided.

Graph Diagram Property				**Graph of Problem B8**
# vertices	6	9	7	
# of edges	8	7		
# of components	1			
Maximum degree	5			
Minimum degree	1			
Size of largest clique	3 (vertices)			
Size of longest path	5 (edges)			
Size of largest cycle	5 (edges)			
Size of largest independent set	3 (vertices)			