CS 278	**Analysis of Algorithms**	Test 3
Name:	Summer 2001	Max Pts: 52

Important: This is an open book test. You can use any books, notes, or paper. You are **not** allowed the use of any electronic device, including calculator, PDA, laptop, desktop, and cell phone. Any calculations and rough work can be done on the back side of the test pages. You will lose five points for not writing your name.

1. [12 pt] Draw the binary search tree for the keys

   `i f g a m t x k p w e l y v j c q u b o r z h d`

   assuming that the keys are received in the order given. Show the resulting tree by deleting the key `y`.

2. [10 pt] Show the 2-3-4-tree resulting from insertion of the keys

`i f g a m t x k p w e l y v j c q u b o r z h d`

into an initially empty tree. Show the tree after adding each key.

3. [10 pt] Demonstrate the insertion of the keys

```
18 14 13 10 6 22 3 20 11 21 23 9 4 3 2 12 0 8 17 5
```

into a hash table using open addressing with linear probing. Let the table have 23 slots, and let the hash function be $h(k) = k \bmod 23$.

4. [10 pt] Draw the red-black tree built when the keys 9, 12, 45, 52, 1, 37, 49, 62, 97, 87, 44, 2, 94, 8, and 32 are inserted (in that order) into an initially empty tree.

5. [10 pt] Consider the following undirected graph, with specified nodes.

	a	b	c	d	e	f	g
a	-	16	20	3	20	12	19
b	-	-	16	20	19	5	1
c	-	-	-	9	22	3	2
d	-	-	-	-	24	2	14
e	-	-	-	-	-	23	12
f	-	-	-	-	-	-	9
g	-	-	-	-	-	-	-

Determine the weight of a minimal spanning tree in this graph using Kruskal's algorithm.