CS200 Spring 2004
Midterm Exam I
March 3, 2004

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Name _______________________________________

StudentID#____________________________________
1. [15 pts] Short Answer: Fill in the Linux, Eclipse or Java information asked for in each question below.
   
a) [3 pts] What single line of commands would you use to print a list of only the printers, but not the queue information? (hint use the pipe command)
   
   ____________________________

   b) [3 pts] Give an example of casting in Java.
   
   __________________________________________________________

   c) [3 pts] What is the command to give the owner read and write permissions and groups and others read only permissions to the file "index.html"?
   
   ____________________________

   d) [3 pts] You are running program "java prog1". What is the command to redirect both standard out and standard error into "output.log"?
   
   ____________________________

   e) [3 pts] What color does eclipse display "standard error" as in the console window?
   
   ____________________________

2. [30 pts] Multiple Choice. Circle the letter of each statement that is true in each of the statements that follow the beginning statement. Note: there can be more than one or no true answers to each statement.
   
a) Which of the following are true about QuickSort?
      
i) In-place.
      
      ii) Worst case is when data are already sorted.

      iii) O(n log n) best case time complexity.

b) Which of the following statements describes SelectionSort?

      i) Search the unsorted part of the array for the next highest value and swap its position with the position next to the sorted part.

      ii) To improve the basic algorithm, use binary search to find the position in the array for a swap.

      iii) In-place, O(n) worst case for swaps, O(n^2) best case for compares
Given a singly linked list class with head as the only instance variable and Bailey’s SinglyLinkedListElement class definition, which of the following Java statements could be the body of an implementation of `public Object removeFromHead()` that returns the value in the removed first element assuming the list has at least one element?

i) head = head.next();

ii) return head = head.next();

iii) Object firstval = head.value(); head = head.next(); return firstval;

d) Which of the following is/are true for the Comparator interface?

i) A comparator can be used within a sorting algorithm to facilitate sorting different objects.

ii) A comparator uses the method: int compareTo(Object o).

iii) A comparator can compare comparable objects.

e) Which of the following methods should be part of a SinglyLinkedList class?

i) public int size()

ii) public void setHead(SinglyLinkedListElement newhead)

iii) public boolean contains(Object value)

3. Short Answer based on assignments and your knowledge of binary search, sorting, vectors and linked lists.

a) [15 pts] In your first assignment, you used binary search to determine where to place a new word such that an ArrayList is kept ordered. The effect was to sort the unique words in the message.

i) Which sorting algorithm was this most like? __________________

ii) What is the computational complexity (Big-O) for the sort if you count compares?

Best case = ___________   Worst case = ___________

iii) What is the computational complexity (Big-O) for the sort if you count swaps/moves?

Best case = ___________   Worst case = ___________
b) [10 pts] In assignment 2, you used mergesort to sort the Contacts file. So assignment 1 and 2 required two approaches to the same problem: creating a sorted ArrayList by reading in strings from a file. Which approach is better for this problem? (Circle one and justify your response based on efficiency and use considerations) **BinarySearch+Insert** OR **MergeSort**

c) [10 pts] Assume you were being asked to program a class for keeping track of the allowed email Contacts. The calling code will need to confirm whether a given contact (of type String) is an allowed email address. You get a choice of data structure for storing the Contacts. Which data structure is better for the Contacts? (Circle one and justify your response based on efficiency and use considerations) **Ordered ArrayList** OR **Ordered Doubly Linked List**
4. [20 pts] The following is a modified version of Bailey’s MergeSort. The code is missing two lines and has two other bugs in it. Annotate the code with changes that should fix it so that it sorts an array of numbers from low to high.

```java
private static void mergeSort (ArrayList data, ArrayList temp, int low, int high){
    int n = high-low+1;
    int mid = low + n/2;
    int i;
    for (i = low; i < mid; i++){
        temp.set(i,data.get(i));
    }
    mergeSortRecursive(data,temp,low,mid-1,cnt);
    merge(data,temp,low,mid,high);
}

private static void merge(ArrayList data, ArrayList temp, int low, int mid, int high){
    int ri = 0;
    int ti = low;
    int di = mid;
    while (ti < mid && di <= high){
        if (((Comparable)data.get(di)).compareTo((Comparable)temp.get(ti)) < 0){
            data.set(ri++,data.get(di++));
        }else{
            data.set(ri++,temp.get(ti++));
        }
    }
}
```