COP 3502 (Computer Science I) Test #2: Linked Lists and Algorithm Analysis
Date: 10/4/2013

VERSION A

Directions: This is a multiple choice test. Each question is worth 5 points. Please choose the most accurate answer listed. If the choice "NOTA" is present, this stands for "None of the Above".

Questions 1 – 10 refer to the code handout you have been given.

1) In the function makeStr, which of the following completes the portion of the for loop on line 67 so that the function works properly?

```
a) i=0; i<strlen(word); i++
b) i=0; i<=strlen(word); i++
c) i=strlen(word); i>=0; i--
d) i=strlen(word)-1; i>=0; i--
e) NOTA
```

2) In the function cpyStr, please provide the missing line of code on line 87.

```
a) ans = temp;
b) temp = ans;
c) ans->next = temp;
d) temp->next = ans;
e) NOTA
```

3) In the function cpyStr, please provide the missing line of code on line 89.

```
a) last = temp;
b) last->next = temp;
c) temp->next = last;
d) temp = last;
e) NOTA
```

4) What code should complete line 104 in the function insertFront?

```
a) front->next = NULL;
b) front = rest;
c) rest = front;
d) front->next = rest;
e) NOTA
```

5) What is the problem with switching the order of the two statements in freeWord inside of the if statement on lines 129 and 130?

a) There is no problem in switching these lines. The function would run just fine this way also.
b) Recursive calls must always be the first line of code inside of an if statement.
c) If we free the pointer to the front node first, we lose a pointer to the rest of the memory.
d) If we switch the order, too much memory gets freed.
e) NOTA

6) Fill in the appropriate boolean expression for the while loop in the function catStr on line 139.

```
a) leftSide != NULL
b) leftSide->next != NULL
c) rightSide != NULL
d) rightSide->next != NULL
e) NOTA
```

7) What expression should be on the right-hand side of the equal sign on line 141 in the function catStr?

```
a) leftSide
b) leftSide->next
c) rightSide
d) rideSide->next
e) NOTA
```

8) Which of the following should be returned on line 154 in the function cmpStr?

```
a) 1      b) -1          c) 0      d) op1->ch + op2->ch
e) NOTA
```

9) What should be the boolean expression on line 162 in the function cmpStr?

```
a) op1 == NULL
b) op1 != NULL
c) op1 != op2
d) op1 > op2
e) NOTA
```

10) Why is the memory for myCopy not freed right after the memory for myWord is freed on line 46?

a) The memory this pointer was pointing to was already freed on line 46.
b) This was an accidental omission on the part of the programmer.
c) We use this memory later in main.
d) This memory was statically allocated and doesn't need to be freed.
e) NOTA

11) What is the closed form value of the following summation in terms of n?

$$\sum_{i=n+1}^{2n} (2i - 1)$$

a) n^2 b) $3n^2$ c) $3n^2 + 2n + 1$ d) $4n^2$ e) NOTA

12) Consider plugging into the recurrence relation T(n) = 3T(n-1) + n using the iteration technique to get to an equation of the form T(n) = AT(n - 3) + Bn + C, where A, B and C are constants. What is the value of A?

a) 1 b) 3 c) 9 d) 27 e) 81

13) A program running an $O(n^2)$ algorithm, in an input of size n = 4,000 takes 13 ms. How long will the algorithm take, approximately, to run on an input of size 12,000?

a) 13 ms b) 39 ms c) 78 ms d) 91 ms e) 117 ms

14) You have written a program that iterates through n! permutations to solve an optimization problem. Your program always evaluates each of these n! permutations. If your program takes 2 seconds to run on an input of size n = 11, how long would you expect it to take on an input of size 13?

a) 15 seconds b) ~ 5 minutes c) ~ one hour d) ~ five hours e) ~ 1 day

15) Choose the recurrence relation that best describes the running time of the function shown below in terms of its input value, n.

```
int f(int n) {
    if (n < 2)
        return n;
    int i, sum = 0;
    for (i=1; i<=n; i++)
        sum += i;
    return 2*f(n-1) + sum;
}
```

a) T(n) = T(n - 1) + n b) T(n) = T(n - 1) + 1 c) T(n) = 2T(n - 1) + 1
d) T(n) = 2T(n - 1) + n e) $T(n) = 2T(n - 1) + n^2$

16) What is the worst case run-time of the function below in terms of the input values n and m? (Note: Choose the closest accurate bound given.)

```
int g(int* a, int* b, int n, int m) {
    int i;
    for (i=0; i<n; i++)
        if (a[i])
            return i;
    for (i=0; i<m; i++)
        if (b[i])
            return n+i;
    return -1;
}
```

a) O(n) b) O(m) c) O(nm) d) $O(n^m)$ e) NOTA

17) What is the worst case run-time of the function below in terms of the input value n? (Note: Choose the closest accurate bound given.)

```
int h(int* a, int* b, int n) {
    int i, j = n-1;
    for (i=0; i<n; i++) {

        while (j > i && b[j] < a[i])
            j--;
        if (j <= i)
            return a[i] + b[j];
    }
}
```

a) O(n) b) O(nlgn) c) $O(n^2)$ d) $O(n^3)$ e) NOTA

18) What is the value of the following summation: $\sum_{i=0}^{n}(\sum_{j=0}^{i} 1)$ in terms of n?

a) $\frac{n(n+1)}{2}$ b) $\frac{(n+1)(n+2)}{2}$ c) n^2 d) $(n+1)^2$ e) NOTA

19) Let T(n) = T(n - 1) + (3n - 4) and T(1) = 5. What is a closed-form representation of T(n) in terms of n, for n > 1?

a) $\frac{3n^2+5n+12}{2}$ b) $\frac{(3n-2)(n-1)}{2}$ c) $3n-4$ d) $(3n-4)^2$ e) NOTA

20) What type of lessons does The Voice judge Blake Shelton provide for the contestants on his team?

a) voice b) soccer c) chess d) programming e) surfing