

**BBM201 – Data Structures – Fall 2016**  
**Single Course Exam**  
**7.10.2016**

Name Surname: \_\_\_\_\_

Student ID : \_\_\_\_\_ Section: \_\_\_\_\_

Duration: .... minutes

Question	1	2	3	4	5	6	7	8	9	10	*	Total
Points	10	9	10	7	12	8	12	12	10	10	10	100
Grade												

**Question 1.** Decide if the following statements are true or false, circle your answer. Give a short explanation if you chose 'False'.

a) The worst-case cost to insert an element to the beginning of a linked list of size  $n$  is  $O(1)$ .

True

False

b) The worst-case cost to insert an element to the end of an array of size  $n$  is  $O(n)$ , if there is still space at the end of the array.

True

False

c) The worst-case cost to delete an element from a linked list of size  $n$  is  $O(1)$ .

True

False

d) The worst-case cost to delete an element from an array of size  $n$  is  $O(n)$ .

True

False

e) The memory used to store a linked list of 5 integers is 40 bytes (suppose each pointer is 4 bytes).

True

False

**Question 2.** Mark the following statements as True or False. Provide a short explanation for your answer. Each wrong answer cancels out a correct one.

(a)  $3n^2 + 10n \log n = \Omega(n^2)$

(b)  $3n^2 + 10n \log n = O(n \log n)$

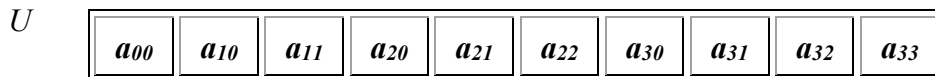
(c)  $n^{100} + 2^n = O(n^{100})$

(d)  $n = o(n^2)$

**Question 3.** Let  $A[n][n]$  be a lower triangular matrix (see the example given below).

The elements of this triangular matrix are stored in a one-dimensional array as given below:

$a_{00}$	0	0	0
$a_{10}$	$a_{11}$	0	0
$a_{20}$	$a_{21}$	$a_{22}$	0
$a_{30}$	$a_{31}$	$a_{32}$	$a_{33}$



- What is the number of items stored in  $U$  if  $A$  has  $n$  rows and  $n$  columns?
- What is  $x$  if  $U[x]$  stores the entry  $A[i][j]$ ? Show your work.
- Please fill in the blanks in the method `readtriangularmatrix(int U[], int n)` that reads integers from the keyboard and fills the one-dimensional array  $U$  with entries of  $A$  as shown in the example.

```
void readtriangularmatrix(int U[], int n){
    int i, j, k;
    if(n*(n+1)/2 > MAX_SIZE){
        printf("\n invalid array size \n");
        exit(-1);
    }
    else
        for(i=0; i<=n-1; i++){
            k=.....
            for(j=0; j<=i; j++)
                scanf("%d", .....);
        }
}
```

**Question 4.** Let  $48+2*35-+47-*$  be an expression given in postfix notation (suppose each number has only one digit again). Fill the table on the right accordingly, if the

input is stored and processed using a stack notation in order to evaluate the given expression. ([0],[1],[2] indicate the position number of an element, [0] being the bottom position.)

Token	Stack			Top
	[0]	[1]	[2]	
4				
8				
+				
2				
*				
3				
5				
-				
+				
4				
7				
-				
*				

**Question 5.** Write a recursive method to free a given linked list.

```

struct node{
    int data;
    struct node* next;
};

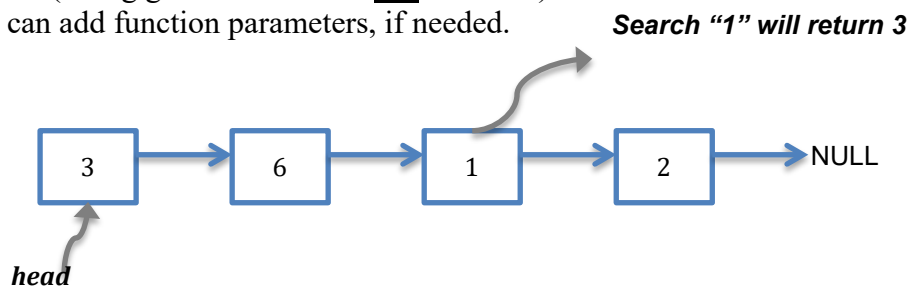
void freeList(struct node* head){

}

```

**Question 6.**

Write a **recursive** method that searches for a value in a linked list and returns the position of the value in the linked list if found, otherwise returns -1. The first item in the linked list has position 1. You can add more parameters for the given method, if needed. (Using global variable is **not** allowed!)  
You can add function parameters, if needed.



```
struct Node{
    int data;
    struct Node* next;
};
```

```
int SearchItem(struct Node* head, int value    )
{
```