Name _____

CSI – Final exam (Time 180 Minutes, Max marks 50, Weightage 50%)

Notes:

1. This is an open book (only the text book and your notes) exam but you **can't connect to the internet to google or try the code on the machine before writing the answers**
2. There is no copying allowed. If caught, you and the other party will get a zero (each) – No questions asked
3. Please write the answers in the space provided. Try to avoid attaching extra sheets as most of the questions need very short and succinct answers.
4. Feel free to use sheets to do your work. However please don't attach them to the submission

Q1. [1 mark] Select the correct choice: Which of the following is not a dynamic data structure?

a. Linked list.
b. Stack.
c. Array.
d. Queues.

Q2. [1 mark] What value does the function my_mystery return when called with a value of 4?

Ans: ____

```
int my_mystery ( int number )
{
if ( number <= 1 )
        return 1;
else
        return number * my_mystery( number – 1 );
}
```

Q3. [2 mark] Provide a short answer (25-30 words) Recursion could be memory-intensive because:

Q4. [1 mark] Select the correct choice: Which of the following statements about stacks is incorrect?

a. Stacks can be implemented using linked lists.
b. Stacks are first-in, first-out (FIFO) data structures.
c. New nodes can only be added to the top of the stack.
d. The last node of a stack has a null link.

Q5. [1 mark] In the context of computer science, what does ADT stand for? Ans:

_____

Q6. [2 marks] Which of the following statements is false?

A. A queue can be implemented with a singly linked list.
B. A queue can be implemented with two stacks.
C. A stack can be implemented with a singly linked list.
D. A stack can be implemented with two queues.
E. None of the above.

Q7. [3 marks] The following function finds the maximum value of a given array of integers A[1...n]. But there is a line of code missing. What should it be?

```
public int findMax(int[] A, int N)
{
        int   maxVal = A[1];
        for (int i = 2; i <= N; i++)
        {
                { missing statement }
        }
        return maxVal;
}
```

The missing code line (only one line is needed) is:

_____

Q8. [4 marks] Given an array A[0...n] of coefficients and a known value of x, the value of the polynomial P = a[n]xn + a[n-1]xn-1 + ... + a[2]x2 + a[1]x + a[0] can be obtained by straightforward multiplication of its coefficients with its terms. Its value can also be computed using Horner's Rule: P = a[0] + x(a[1] + x(a[2] + ... + x(a[n-1] + x(a[n])) ...))

What does the following code compute? (Assume that the value of x is known, and that m, i, k and P are of the correct types)

```
P = 0;
for (i = 1; i <= n; i++)
{
        P = (P + a[i]) * x;
}
P += a[0];
```

Ans:

Q9. [4 marks] There are two algorithms which accept a certain input. The size of this input is denoted by n. The order of the first algorithm is $10 * n * \lg n$ while that of the second is $2 * n^2$ (assume n is an integer). Under what input conditions will the first algorithm be slower than the second? Show your working below

Q10. [3 marks] What will be the output of the following program after compiling? Why (explain in about 50 words)?

```
#include<stdio.h>
int main(){
 int a=5;
 float b;
 printf("%d",sizeof(++a+b));
 printf(" %d",a);
 return 0;
}
```

Q11. [3 marks] What will be the output of the following program after compiling? Why (explain in about 50 words)?

```
#include<stdio.h>
int main(){
 int array[3]={5};
 int i;
 for(i=0;i<=2;i++)
  printf("%d ",array[i]);
 return 0;
}
```

Q12. [3 marks] What will be the output of the following program after compiling? Why (explain in about 50 words)? [**Hint**: In case you are wondering, there will be no compilation error!]

```
#include<stdio.h>
void call(int,int,int);
int main(){
 int a=10;
 call(a,a++,++a);
 return 0;
}
void call(int x,int y,int z){
 printf("%d %d %d",x,y,z);
}
```

Q13. [3 marks] What will be the output of the following program after compiling? Why (explain in about 50 words)?

```
#include<stdio.h>
int main(){
 int a=5;
 int b=10;
 {
  int a=2;
  a++;  b++;
 }
 printf("%d %d",a,b);
 return 0;
}
```

Q14. [3 marks] What will be the output of the following program after compiling? Why (explain in about 50 words)? [**Hint**: Some of you may have come across this in your projects]

```
#include<stdio.h>
int main(){
  float f=5.5f;
  float x;
  x=f%2;
  printf("%f",x);
  return 0;
}
```

Q15. [5 marks] What will be the output of the following program after compiling? Why (explain in about 100 words)? [**Hint**: You need to think on the lines of binary representations of various data types as well as their sizes]

```
#include<stdio.h>
int main(){
  int a = 320;
  char *ptr;
  ptr =( char *)&a;
  printf("%d ",*ptr);
  return 0;
}
```

Q16. [3 marks] What will be the output of the following program after compiling? Why (explain in about 50 words)? [**Hint**: Some of you may have come across this in your projects]

```
#include<stdio.h>
int main()
{
char arr[10];
arr = "ISI";
printf("%s",arr);
return 0;
}
```

Q16. [8 marks] We have seen the concept of a linked list. Below is a simple case of a linked list where we define a book as a list structure. The code below that is a sample code that adds a node. For a linked list such as this one, write a small function that will determine if the linked list contains a cycle in it, and, at what node the cycle starts. (**Note**: Marks will be awarded for the correct logic and proper syntax convention.)

```
typedef struct book_details Book;
struct book_details {
int ISBN;
char BookTitle[50];
char AuthorName[50];
char ClassificationCode[20];
Book *nextBook;
};

Now let's use this structure
Book * newBook = NULL;
 /* Make the new node */
newBook = (Book *) malloc(sizeof(Book));
newBook->ISBN = getISBN();
```