North South University
Department of Electrical and Computer Engineering
Mid-term Exam – Fall 2021
CSE 215 - Programming Language II
Full Marks: 50
Duration: 60 minutes
[Answer All Questions. All answers must be in your own language. An answer will be highly penalized if that is borrowed from other sources]

1. **[25 Points]** Implement the class **Stack**

Stack
- top : int - arr[] : int
+ Stack() + insert(a : int): void + remove() : int + search(a : int): int + getStackSize() : int + displayStack(): void + deleteStack(): void

```
public class TestStack {
        public static void main (String[] abc)
        {
                Stack s = new Stack();
                s.push(1); s.push(5); s.push(8); s.push(80);
s.push(2);
                s.pop();
                s.pop();
                s.displayStack();
                System.out.println("\n" + "The size of the stack:
" + s.getStackSize());
        }
}
/* This code should yield the following output:
1 5 8
The size of the stack: 3 */
```

- Data field ‘top’ holds the index of the last element of the data field arr[].arr[] is the storage of the stack. Initially, as there will be no elements in the stack so the top should have an initial value -1. Integer elements can be inserted and popped out from arr with the last in first out (LIFO) manner.
- Stack() is a no-argument constructor that defines the arr[] with a default size 1000 and initializes it with all zeros.
- insert(a : int) inserts the value ‘a’ to the top position of arr[]
- remove() returns the value of the top position of arr[] and removes that value from arr[]
- search(a : int) finds the value ‘a’ inside arr[] and returns the index where found. If not found, then it retunes -1.
- getStackSize() returns the number of elements currently holding inside arr
- displayStacshk() prints currently holding elements of the array.

- removeAll() deletes all elements from the stack, if it exists, by assigning zeros in it. Then,'top' should hold the initial value.

2. **[5 Points]** Write a method having a 2D integer-valued matrix as an argument and returns a boolean value whether the input 2D matrix is an identity matrix or not. Note, an identity matrix contains 1s in its main diagonal positions and 0s in other locations.

3. **[5 Points]** What is an overloaded constructor? How to call an overloaded constructor from any constructor? Explain with code examples.

4. **[5 Points]** Write five differences between **C and Java** programming language in respect of compilation and running programs.

5. **[5 Points]** What do you mean immutable objects? Explain with code examples.

6. **[5 Points]** We can access the value of constant PI using built-in Math class like Math.PI. Write a single line answer of the following questions.

   (a) Why don't we need to import anything to access Math class members/methods?

   (b) How it becomes possible of accessing PI attribute of Math class without creating any instance of Math class?

   (c) Moreover, we cannot update the value of PI for example, Math.PI = 22/7. What is the reason behind that?