National University of Computer & Emerging Sciences, Karachi
Fall 2021 (School of Computing)
Midterm I Examination

Course Code: CS-4042	**Course Name:** Information Processing Techniques
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Student ID:	**Section:**
Date: September 27, 2022	**Time:** 11:30 am – 12:30 pm (60 minutes)

Instructions:
- Attempt all questions
- The paper contains 4 questions on 3 pages.
- Return the paper after the exam.

Max Points: 40

Question 1: Multiple Choice Questions (Multiple options can be selected) **(10 Points)**

1. The difference between for and foreach is that
a) The foreach statement repeats a group of embedded statements for each element in an array or an object.
b) The for loop executes a statement or a block of statements repeatedly until a specified expression.
c) both a and b.
d) For repeats fixed number of times whereas foreach repeats for infinite number of times

2. The Boolean variables result in the values
a) True and False   c) both a and b
b) 0 and 1   d) simple english language

3. The type of conversions that the C# compiler does itself and the type of conversions that user has to perform by using predefined functions are
a) Implicit ,Explicit   b) Explicit, Implicit   c) External, Internal   d) Internal, External

4. What is the output of the following code
```
static void Main(string[] args)
{
 int myInteger;
 string myString;
 myInteger = 17;
 myString = "\"myInteger\" is";
 Console.WriteLine("{0} {1}.", myString, myInteger);
 Console.ReadKey();}
```
a) My integer is 17   c) Errors due to wring memory allocation
b) "myInteger" is 17.   d) 0,1 "myInteger" is 17.

5. Which of the following belongs to .NET
a) JIT(Just in time) and CIL(Common intermediate   c) final
language)   d) A and B
b) CLR(Common Language Runtime)

6. Can you overload a function with the same number and types of arguments (parameters) but with a different return type
a) yes   c) Yes, but only if function is static
b) no   d) Yes, but only if function is virtual

7. What is an equivalent of .NET's MSIL in Java?
a) CLI   b) Bytecode   c) Garbage Collector   d) Both (a) and (c)

8. XML uses the features of
a) HTML   b) XHTML   c) VML   d) SGML

9. Which of the following statements are correct about exception handling in C#.NET?
  I.   *try* blocks cannot be nested.
  II.   In one function, there can be only one *try* block.
  III. An exception must be caught in the same function in which it is thrown.
  IV.   All values set up in the exception object are available in the *catch* block.
  V.   While throwing a user-defined exception multiple values can be set in the exception, object.

a) I only   b) I and II only   c) III only   d) IV and V only
e) All of the above

10. Which of the following statements are correct?

I.	A struct can contain properties.	IV.	A struct cannot contain methods.
II.	A struct can contain constructors.	V.	A struct cannot contain constant
III.	A struct can contain protected data members.		

a) I and II   b) III, and IV   c) I, II and IV   d) III and V

Question 2: State the following as True or False and in case of false, justify your answer.   (5 Points)
1. Memory management is among the responsibilities of the CLR.   True
2. Domain-specific data and business logic is represented by View in MVC architecture.   False
    Business logic and data is represented by Model as properties and methods
3. To install a web service, following command can be executed:
    installutil <service.exe>   True
4. Managed code does not require to be executed under the management of CLR.   False
    All managed code must be run under CLR management in .NET framework
5. Namespace is a logical separation of code.   True

Question 3: Answer the following questions briefly. You may use diagrams where necessary.
1. What is the difference between Abstract Class and Interface? Explain one scenario each where one will be a better choice than the other.   **(3 Points)**

Answer:
Abstract Class

  • Abstract classes offer default functionality for the subclasses.
  • Provides a template for future specific classes
  • Helps you to define a common interface for its subclasses
  • Abstract class allows code reusability.

Example:
An abstract class allows you to create functionality that subclasses can implement or override.
Interface

  • Interfaces are used to achieve abstraction.
  • Designed to support dynamic method resolution at run time
  • It helps you to achieve loose coupling.
  • Allows you to separate the definition of a method from the inheritance hierarchy

Example:
you must use an interface if you want to simulate inheritance for structs, because they can't actually inherit from another struct or class.

2. Explain when using the following would be the most suitable option.   **(3 Points)**
    a)   int[]   b)   ArrayList()   c)   List<int>

Answer: When you have fixed number of elements for a specific data type then you would use int[].
When you are not certain for the number of elements neither the data type that will be used then you would use ArrayList
When you are not certain for the number of elements but you want to have data of integer type only then you would use the generic List.

3. What is meant by Serialization and Deserialization? For the given class, modify the code so that the password field is not part of the serialization process. **(3 Points)**

```
[Serializable]
public class Credentials {
    public string username { get; set; }
    public string password { get; set; }
}
```

Answer: Conversion of object or graph into its equivalent representation in bytes of stream like XML is called Serialization and Conversion of bytes of stream into object or graph is called deserialization.

```
[Serializable]
public class Credentials {
    public string username { get; set; }
    [Nonserializable] public string password { get; set; }
}
```

4. Explain how Dot Net code is compiled and executed on a given system (You may explain in words or by using a diagram). **(3 Points)**

Answer:
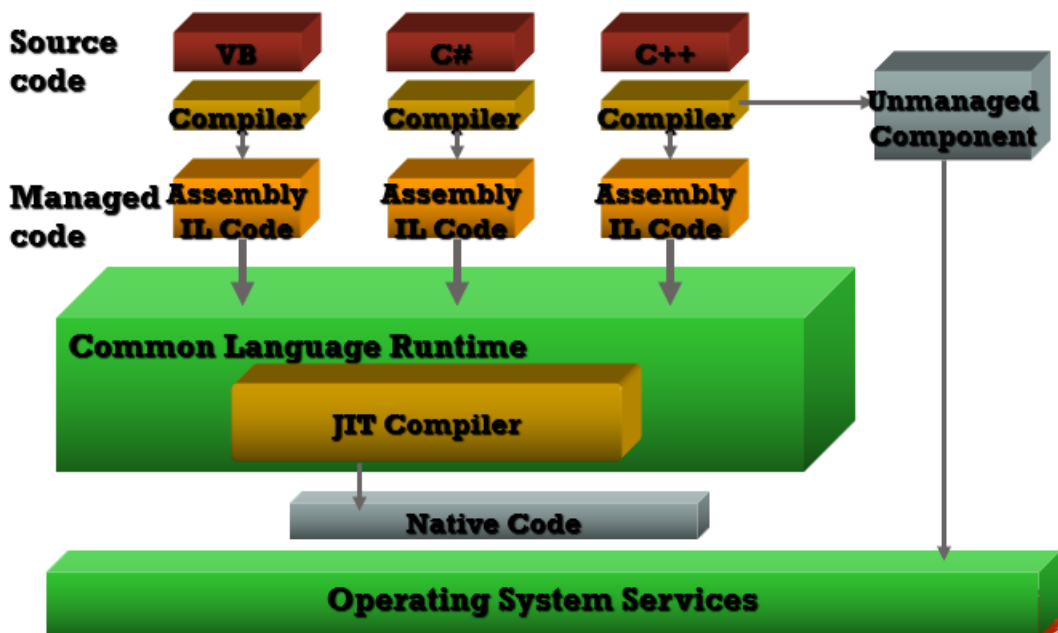
5. Explain the following
   a) What is a Windows Service? **(3 Points)**

   Answer: It is a long running program. It does not have any User Interface. It runs in the background and needs to be installed before execution.

   b) Suppose you are developing a Web Scrapping project where you will be downloading the Academic Calendar from your university's website every 15 days and storing it in the database. Answer the following questions in your own words:
   i.   For this task, should we have single or multiple windows services and why? **(1 Point)**
        Answer: We should have multiple:
        - One for downloading the page
        - One to extract data from the offline version
        - One can be just to store it into the database

ii.   Which Startup type will help to make sure the service is running even if the system is restarted? **(1 Point)**

Answer: Automatic startup type

6. A bracket is considered to be any one of the following characters: **(,)**, **{,}**, **[,** or **]**. Two   **(8 Points)** brackets are considered to be a matched pair if the an opening bracket (i.e., **(, [,** or **{**) occurs to the left of a closing bracket (i.e., **),],** or **}**) of the exact same type. There are three types of matched pairs of brackets: **[ ]**, **{ }**, and **( )**.

A matching pair of brackets is not balanced if the set of brackets it encloses are not matched. For example, **{ [( ]) }** is not balanced because the contents in between { and } are not balanced. The pair of square brackets encloses a single, unbalanced opening bracket, (, and the pair of parentheses encloses a single, unbalanced closing square bracket, **]**.

By this logic, we say a sequence of brackets is balanced if the following conditions are met:

- It contains no unmatched brackets.
- The subset of brackets enclosed within the confines of a matched pair of brackets is also a matched pair of brackets.

Given a string of brackets, complete the following function to determine whether the sequence of brackets is balanced. If a string is balanced, return YES. Otherwise, return NO.

Answer:
```csharp
public static string isBalanced(string s)
{
    Stack<char> chars = new Stack<char>();
    bool flag = true;
    foreach (char c in s) {
        if(c == ')' || c == '}' || c == ']') {
            if (chars.Count == 0) {
                flag = false; break;
            }
            else if (chars.Count > 0)
            {
                if (chars.Peek() == '(' && c != ')') {
                    flag = false; break;
                }
                else if (chars.Peek() == '{' && c != '}') {
                    flag = false; break;
                }
                else if (chars.Peek() == '[' && c != ']') {
                    flag = false; break;
                }
                else
                    chars.Pop();
            }
            else
                chars.Push(c);
        }
        else
            chars.Push(c);
    }

    if (!flag || chars.Count > 0)
        Console.WriteLine("No");
    else
        Console.WriteLine("Yes");

}
```

Function Description
isBalanced has the following parameter(s):
- *string s*: a string of brackets

Returns
  string: either YES or NO

Sample Input / Output

Input: **{ [( )] }**   Output: **YES**
Input: **{ [( ]) }**   Output: **NO**
Input: **a**   Output: **YES**
Input: **(( )**   Output: **NO**

BEST OF LUCK!

Input: **{ [( )] }**   Output: **YES**
Input: **{ [( ]) }**   Output: **NO**
Input: **(( )**   Output: **NO**