# Technical Assessment

## Candidate Details

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| Test | Software Developer |
| Version | 2.0 |
| Time | 2 Hours |
| Name | Aubrey Nkanyani |
| ID Number | 8510205723083 |
| Date | 20-03-2018 |

## Code Questions

Answer these questions in the Visual Studio solution supplied to you.

1. Exception Handling

In the ExceptionHandling project, handle the divide by 0 exception by inserting an exception handler.

1. String Manipulation

The StringReverse project writes the contents of the "value" variable to the console. Change the application to reverse the letters in the individual words without changing the position of any apostrophe’s relative to each word. Emit the new string to the console.

1. XSD

In the XSD project, add code in the Click event of the Generate XML button to generate and display an XML document representing the information captured on the form. The document must conform to the Members schema contained within the project.

1. Reflection

In the Form1\_Load event of the Reflection project, use Reflection to instance SampleClass and call TestMethod, passing a test string value as an argument

1. HTTP

Modify the project to replace all occurances of the word ‘Google’ with ‘Zoogle’ in the page that is loaded into the WebBrowser. Hint: you can achieve this either by downloading the page to a string, modifying and then sending that content into the WebBrowser control or you can dynamically modify the WebBrowser DOM

1. Database

* Create a database in MS SQL
* In the database created above, create a table called Members. The table should contain a GUID primary key field and fields for first name, surname and email address. Set a default value for the primary key.
* Create a table called ActivityLog containing a GUID primary key field, a date, a second GUID field called MemberID and an action value which will hold an identifier for Add, Update or Delete
* Populate the Members table with 5 rows of dummy data
* Create a view that returns a list of members, splitting the email username and domain into separate fields.
* Create a view to count the number of members sharing a common email domain name. The view should return the domain name and the number of members with an email address ending with that domain name.
* Add a trigger to the member table that is called on an add, update or a delete occurs on the Members table. When invoked, the trigger should call a stored procedure passing the primary key value for the row being altered. The stored procedure should insert an entry into the ActivityLog table to log the current transaction, storing the primary key in the Member ID and setting the other fields to appropriate values.
* Generate a script for your database including all objects and data and include the script in your assessment response.

1. (Not relevant to this assessment)
2. Collections

In the Collections project, implement the Intersection method to return the intersection of employees and otherEmployees. (intersection is the list of employees which fall into both lists)

1. Threading

The Threading project uses multiple threads to simulate multi-threaded access of a resource. The resource in question may only be accessed by a single thread at a time. Using multi-threaded techniques modify the application to protect the resource against concurrent use by multiple threads. You may not modify the Main() or the UseResource() methods.

1. XML

Within the Question.xml XML file in the XML project there is an XML document. The document contains several XML elements, some of which contain "Value" attributes. Write an application to sum up all of the "Value" attributes in the entire document and write the result to the console.

1. Scheduler

In the scheduler project, add implementation to the Scheduler.DueNow() method so that it returns true when invoked between the specified start and end times at the interval specified. The interval is represented as seconds and the timer on the main form invokes this method every every 200ms. Ensure that DueNow only returns true once for each intervalSecs interval and only when the current time is between the start and end times specified.

1. (Not relevant to this assessment)
2. Application of Monitoring system

The project includes a class that provides generic internal application monitoring. Illustrate how this system is intended to be used by creating a class containing objects that are monitorable by this solution. Attach monitoring using the Add\* methods in ResourceMonitor and provide a button on the Form to present the monitoring snapshot to the user.

1. Add code in Program.cs of the SandboxerDemo project to create a sandboxed AppDomain and then instance SampleClass from the SandboxedDemo project and execute the TestMethod method. Only execution permissions should be granted to the sandboxed AppDomain so that it is not permitted to access the filesystem.

## Written Questions

Answer these questions on this document.

1. String Manipulation
   1. The Microsoft.NET framework includes the System.Text.StringBuilder class. When would you make use of this class?

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| System.text.StringBuilder can be used when you want to alter a string without creating a new object. Example of using a stringbuilder class can boost performance when concatenating many strings together in a loop |

* 1. In Microsoft.NET strings are immutable. What does this mean?

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| It means that the state of the object cannot be changed effectively, this means the object has no data membersthat have values that can be changed once the object is created. |

1. OOP – Simple
   1. Does C# support multiple inheritance?

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| C# 3.5 or below that, don’t support multiple inheritance but after they support it |

* 1. Does VB.NET support multiple inheritance?

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| YES |

* 1. What is the difference between an Abstract class and an Interface?

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| Abstract allow you to create class and class members which are incomplete and they will be implemented in the derived class.  Interface is a reverse C# keyword that allows you to enable a non-implemented type consisting of member signature. |

1. OOP – Complex
   1. Explain the principle of polymorphism.

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| Allows you to invoke the derive class through base class during runtime. |

* 1. When replacing a base method in a class inheriting from a base class, which C# modifier(s) would you use on the base method and which modifier(s) would you use on the new method in order to: (1) override the base method (2) in order to hide the base method?

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|  | (1) Override base method | (2) Hide base method |
| Base method modifier(s) |  |  |
| Inheriting method modifier(s) |  |  |

* 1. What is the difference between overriding and hiding the base method?

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| Method overloading happens in the same class shares the same methods name but each method should have different numbers of parameters or parameters having different types and order. Method overriding derived class have the same method with same name and exactly the same number and type of parameters and same return type as a parent class |

* 1. Under what circumstances would you not be able to override the base method?

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| You cannot override a non-virtual or static method. The overridden base method must be virtual, abstract or override.  You cannot use the new, static or virtual modifiers to modify an override method |

1. Name 2 features new to version 4.5 of the .NET Framework or Visual Studio 2012

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| Profile optimization (improve startup performance)  Garbage collector (GC background cleanup) |

1. Solve the following problem: You have 9 balls and a balance scale. You know that 1 of the 9 balls weighs slightly less than the other 8. You may make use of the balance scale twice only and must determine which of the 9 balls is the lighter.

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| We need to apply a simple logic of weighing THREE balls, out of eight balls, at a time. Step 1 : Place three balls in each side of the balance. the heavier or lighter three balls are to be taken for second step. If both are weighing equally take the balance Two balls or other THREE balls for second step. Step 2 : Similar to the first step place one ball in each side of the balance. The heavier or lighter ball will be known. If both are equal weight then the THIRD ball is odd ball. If the ODD ball in the remaining TWO balls of first step by placing one each of them both sides of balance the ODD ball will be traced. |