INTRODUCTION TO .NET FRAMEWORK

1. **What is .NET Framework?**

.NET Framework is a complete environment that allows developers to develop, run, and deploy the following applications:

- Console applications
- Windows Forms applications
- Windows Presentation Foundation (WPF) applications
- Web applications (ASP.NET applications)
- Web services
- Windows services
- Service-oriented applications using Windows Communication Foundation (WCF)
- Workflow-enabled applications using Windows Workflow Foundation (WF)

.NET Framework also enables a developer to create sharable components to be used in distributed computing architecture. NET Framework supports the object-oriented programming model for multiple languages, such as Visual Basic, Visual C#, and Visual C++. .NET Framework supports multiple programming languages in a manner that allows language interoperability. This implies that each language can use the code written in some other language.

2. What are the main components of .NET Framework?

.NET Framework provides enormous advantages to software developers in comparison to the advantages provided by other platforms. Microsoft has united various modern as well as existing technologies of software development in .NET Framework. These technologies are used by developers to develop highly efficient applications for modern as well as future business needs. The following are the key components of .NET Framework:

- .NET Framework Class Library
- Common Language Runtime
- Dynamic Language Runtimes (DLR)
- Application Domains
- Runtime Host
- Common Type System
- Metadata and Self-Describing Components
- Cross-Language Interoperability
- .NET Framework Security
- Profiling
- Side-by-Side Execution

3. What is Microsoft Intermediate Language (MSIL)?

The .NET Framework is shipped with compilers of all .NET programming languages to develop programs. There are separate compilers for the Visual Basic, C#, and Visual C++ programming languages in .NET Framework. Each .NET compiler produces an intermediate code after compiling the source code. The intermediate code is common for all languages and is understandable only to .NET environment. This intermediate code is known as MSIL.

4. What is an IL?

Intermediate Language is also known as MSIL (Microsoft Intermediate Language) or CIL (Common Intermediate Language). All .NET source code is compiled to IL. IL is then converted to machine code at the point where the software is installed, or at run-time by a Just-In-Time (JIT) compiler.

5. Describe the roles of CLR in .NET Framework.

CLR provides an environment to execute .NET applications on target machines. CLR is also a common runtime environment for all .NET code irrespective of their programming language, as the compilers of respective language in .NET Framework convert every source code into a common language known as MSIL or IL (Intermediate Language).

CLR also provides various services to execute processes, such as memory management service and security services. CLR performs various tasks to manage the execution process of .NET applications.

The responsibilities of CLR are listed as follows:

- Automatic memory management
- Garbage Collection
- Code Access Security
- Code verification
- JIT compilation of .NET code

6. Differentiate between managed and unmanaged code?

Managed code is the code that is executed directly by the CLR instead of the operating system. The code compiler first compiles the managed code to intermediate language (IL) code, also called as MSIL code. This code doesn't depend on machine configurations and can be executed on different machines.

Unmanaged code is the code that is executed directly by the operating system outside the CLR environment. It is directly compiled to native machine code which depends on the machine configuration.
In the managed code, since the execution of the code is governed by CLR, the runtime provides different services, such as garbage collection, type checking, exception handling, and security

support. These services help provide uniformity in platform and language-independent behavior of managed code applications. In the unmanaged code, the allocation of memory, type safety, and security is required to be taken care of by the developer. If the unmanaged code is not properly handled, it may result in memory leak. Examples of unmanaged code are ActiveX components and Win32 APIs that execute beyond the scope of native CLR.

7. Mention the execution process for managed code.

A piece of managed code is executed as follows:

- Choosing a language compiler
- Compiling the code to MSIL
- Compiling MSIL to native code
- Executing the code.

8. What is the role of the JIT compiler in .NET Framework?

The JIT compiler is an important element of CLR, which loads MSIL on target machines for execution. The MSIL is stored in .NET assemblies after the developer has compiled the code written in any .NET-compliant programming language, such as Visual Basic and C#.

JIT compiler translates the MSIL code of an assembly and uses the CPU architecture of the target machine to execute a .NET application. It also stores the resulting native code so that it is accessible for subsequent calls. If a code executing on a target machine calls a non-native method, the JIT compiler converts the MSIL of that method into native code. JIT compiler also enforces type-safety in runtime environment of .NET Framework. It checks for the values that are passed to parameters of any method.

For example, the JIT compiler detects any event, if a user tries to assign a 32-bit value to a parameter that can only accept 8-bit value.