

1. Briefly explain the need for a programming language?

- A computer cannot understand English or Other Language Except 1 and 0. Therefore Programming languages are used to give a set of instructions to the computer to perform a Specific Task. (Rilwan, 2022)

2. Compare and contrast the differences between the following.

- a) **Source Code** – Source Code is a set of instructions written by an IT Professionals' using a programming Language. (Satyabrata\_Jena, 2022)

**Machine Code** – Machine Code is a low-level code which is Understandable by the Computer and it is a Combination of Binary Numbers and looks like a very long sequence because it consists of zeroes and Ones. (Satyabrata\_Jena, 2022)

#### Difference Between Source Code and Machine Code

Source Code	Machine Code
Source Code is Written by a Human or an It Professional.	Machine Code is not Generated by a Human and it Can Only be Generated by Compiler or another Translator.
It is a High-Level Code.	It is a Low-Level Code
Source Code are Written in High Level Programming Languages in a Plain Text.	Machine Code is in Binary Format as it Translates Source Code. (Computer Can only Understand Binary.)
It is Fully Understandable to IT Professionals and Partially for Humans.	It is not Human Understandable due to Sequence of Zeroes and Ones.
Machine Cannot Understand the Source Code directly.	Machine Can Understand the Machine Code and Easily Executable.
Easy to Modify	It Cannot be Modified.
Source Codes are Written in High-Level Languages Like Java, Python, C++, C, etc...	Machine Codes are Written in Machine Language (Ones and Zeroes) using Assembler, Compiler, Interpreter, etc.

- b) **High-Level Language** – A high-level language is any programming language that allows programs to be developed in a more user-friendly programming context,

usually independent of the computer's hardware architecture. (byju's Exam Prep , 2022)

**Low-Level Language** – A low-level language is a type of programming language that hold basic instructions recognized by computers. (byju's Exam Prep , 2022)

#### Difference Between High-Level Language and Low-Level Language

High-Level Language	Low-Level Language
It is a very Programmer Friendly Language and Easy to Understand.	It is a Machine Friendly Language and Hard to Understand.
It is Portable	It is not Portable
Needs a Compiler or Interpreter for Translation.	Need an Assembler for Translation
It is Generally used for Programming.	It is not Popular in today's world and not Commonly used.
It is Simple in Debugging.	It is Bit Complex in Debugging Comparatively.
Less memory efficient, uses more memory than low-level languages.	Less memory usage.

(byju's Exam Prep , 2022)

- c) **Compiler** - A compiler is a special program that converts the source code of a programming language (High-Level Language) into machine code or another programming language (Low-Level Language). (Sheldon, 2022)

**Interpreter** - An interpreter is a computer program used to straightway execute program instructions written in one of numerous high-level programming languages. (Sheldon, 2022)

#### Difference Between Compiler and Interpreter

Compiler	Interpreter
The compiler scans the entire program at once.	Translates Program Statements Statement by Statement.
Codes are Scanned in one Pass, so Errors (if any Present) are Grouped at the Very End.	Errors are Displayed line by line as the Code is Scanned line by line.
The Main Advantage of the Compiler is Execution Time.	The interpreter is less Preferred Because it Executes object code Slower.

Converts Source Code to Object Code (Machine Code).	Scan the Source Code line by line instead of Converting it to object code.
No Source Code Required for Later Execution	Need Source Code to run Later.
Machine Code is Stored on the Disk Storage.	Machine Code is not Stored Anywhere.

(BI INDIA BUREAU, 2019)

- d) **Structured Language** - Structured programming is a paradigm intended to make programs easier to understand from the reader's point of view. (Rebus Community, n.d.)

**Object-Oriented Language** - An object-oriented language (OOL) is a high-level computer programming language that implements objects and their associated procedures within a programming context to create software programs.

#### Difference Between Structured Language Vs Object-Oriented Language

Structured Language	Object-Oriented Language
A subset of Procedural Programming.	It relies on the concept of objects, which contain data and code.
The Program is split into Smaller Programs or Functions.	Programs are divided into objects or entities.
To make it easier to write programs with readable code and reusable Components.	The point is to create objects that typically contain both functions and data.
Its main goal is to improve and increase the quality, clarity and development time of computer Programs.	Its main goal is to improve and increase both the quality and productivity of system analysis and design.
Usually only focused on the functions and processes that Process Data.	Focuses on representing both the structure and behaviour of information systems in small or small modules that typically combine data and process both.

(madhurihammad, 2022)

- e) **C** – C is a very popular, easy-to-use, and flexible universal programming language. (techopedia, 2018)

**C ++** - C++ is an object-oriented programming language (OOP) and is considered by many to be the best language for building large-scale applications. (w3schools, n.d.)

<b>Language C</b>	<b>Language C ++</b>
C Was Developed by Dennis Ritchie at Bell Labs in 1972.	C++ was developed by Bjarne Stroustrup at Bell Laboratories in the early 1980s.
Is a Function Driven Language.	Object driven language.
C is a Procedure-oriented Language. Object- Oriented Programming (OOP) Feature such as polymorphism, encapsulation, and inheritance programming are not supported.	C++ is both a procedural and an object-oriented programming language. It supports his OOP features like polymorphism, encapsulation and inheritance.
C is a Subset of C++	C++ is a superset of C.
C has 32 Keywords	C++ has 63 keywords.
Support Built in data Types	Supports both built-in and user-defined data types.
No Access Modifiers.	There is an access modifier.

(tutorialspoint, n.d.)

- f) **C++** - C++ is an object-oriented programming language (OOP) and is considered by many to be the best language for building large-scale applications. (w3schools, n.d.)

**Java** – Java is a Popular Language in the Present Software Development Market due to the demand of the Language.

#### Difference Between Language C and Language Java

Language C	Language Java
C was developed by Dennis M. Ritchie between 1969 and 1973.	Java was developed by James Gosling in 1995.
C is a procedural programming language.	Java is an object-oriented language.
C is more procedural.	Java is more data oriented.
C is a mid-level language because it bridges the gap between machine-level and high-level languages.	Java is a high-level language because code is translated into machine language using a compiler or interpreter.
C is a compiled language. In other words, it translates code into machine language so that it can be understood by machines and systems.	Java is the interpreted language of Java. The code is first converted into bytecode and then this bytecode is executed by his JVM (Java Virtual Machine).
C is generally decomposed into functions.	Java is split into objects.

(javatpoint, n.d.)

- g) **Syntax Error** - A syntax error in computer science is an error in the coding or programming language syntax entered by the programmer. (javatpoint, n.d.)

**Logical Error** – A logic error is an error in the source code of a program that causes unexpected and incorrect behaviour. (techopedia, n.d.)

#### Difference Between Syntax Error and Logical Error

Syntax Error	Logical Error
A syntax error is an error in the syntax of a series of characters or tokens intended to be written in a particular programming language.	A logic error is an error in a program that does not function properly but does not terminate abnormally.
A syntax error occurs due to incorrect syntax in the program.	A logic error has occurred due to an algorithm error.

In compiled languages, compilation shows syntax errors along with position and errors.	Programmer must find error by himself.
Easier to identify syntax errors.	Logic errors are relatively difficult to identify.

(Golden, n.d.)

3. Write a Short Description of leading Software Development Firms Renowned in the Globe and Sri Lanka

- i. **VIRTUSA** – Virtusa is the biggest software development firm in Sri Lanka in number of employees. It provides wide range of services for the following sectors such as Banking, Financial Services, Insurance, Healthcare, Telecommunications, Media, Technology Industry, etc. It has 2000 companies worldwide. Virtusa was Founded in 1996 and the Founders are Kris Canekaratne, Tushara Canekaratne, John Gills and Sandy Gills.

Virtusa offers wide range of job opportunities and some of them are Software Engineer, Network Engineer, QA Analyst, QA Engineer, Cloud Engineer, Data Scientist, etc.

- ii. **London Stock Exchange Group Sri Lanka - LSEG** is a Popular Software Development Firm in Sri Lanka and Globe with a staff of more than 25000. In Sri Lanka there is a big demand in getting a job offer from LSEG Due to its high Salary Scale. This Organization was founded in 2007 and offers wide range of services such as Stock Controls, Trading, etc. Mr David Schwimmer is the Present CEO of the Company.

LSEG offers Many job opportunities compared to other Leading IT Companies in Sri Lanka with high Salary Margins. Few of these roles are Capital Market Analyst, Business Analyst, Cloud Architect, Software Developer, Senior Tech Lead, Java Lead, etc.

- iii. **WSO2** - Founded in 2005, WSO2 is a leading provider of open-source integrations in Sri Lanka. The open-source integration services provided by WSO2 are a quick step towards future trends in the IT industry, enabling fast and free flow of data to potential consumers. API Manager, Enterprise Integrator and Identity Saver are some of the popular products that WSO2 specializes in. With 15 years of experience in healthcare, finance, retail, telecommunications and a global customer base, WSO2 provides software solutions to reputable companies such as eBay, The Warehouse Group, Karnataka Bank Ltd and Qantas. . (digitalokee, n.d.)

WSO2 Offers Jobs such as Program Developer, Software Engineer, Software Architect, Business Analyst, Data Scientist, Tech Lead, Java Lead, Project Managers, etc.

- iv. **JOHN KEELS IT** - John Keels IT is a subsidiary of the parent company. John Keels Holdings PLC, which specializes in technology consulting. Headquartered in Colombo, John Keels IT is one of Sri Lanka's oldest IT solutions companies, with over 20 years of experience in the industry, aiding motivated companies develop technology-enabled business solutions and strategies. We help you improve efficiency and effectiveness. John Keels' major IT services include IT strategy, digital marketing consulting and technology, program management, outsourcing and offshoring services. With a customer base of over 500 clients, John Keels prides itself on its innovative tendencies. configuration options. Mr Krishan Balendra is the Present CEO of the Company.

John Keels It offers same job roles as the above Companies that are listed as those are the most demanding jobs in the World of It.

- v. **SYSCO LABS** - Sysco labs is a technology strategy developer for Sysco Cooperation, the world's largest foodservice company based in Sri Lanka and the United States. Sysco focuses on marketing, sales and distribution of food, equipment and consumables and worldwide he has a customer base of over 650,000. Working with a team of highly skilled individuals in Sri Lanka and the United States, Sysco labs aims to provide customers with a quality food service experience, from grocery sourcing to ordering to delivery to e-commerce services. Committed to innovative technological disruption. Software development, enterprise architecture, quality development, project management, UI/UX, data and analytics, cloud services, and application support are some of the services Sysco labs manages for Sysco Corporation. Mr shanil Fernando is the present CEO of the Company.

Business Analyst, Java, C, JQuery Developers, Back-end & Front-End Developers are some of the most available Vacancies that are present in this Organization with huge number of Vacancies.

- I. **MICROSOFT CORPORATION** - Microsoft Corporation is established in Redmond, Washington, and is certainly considered one among the biggest organizations withinside the global and leads a listing of Top 10 IT Companies. The business enterprise has been pulling massive numbers at some point of the years. Microsoft's economic stats display the business enterprise's annual sales surpassed \$one hundred billion in 2018, reached \$125.eighty-four billion in 2019, and noticed a 17% boom from 2020 to 2021.

The merchandise like Microsoft Windows, Microsoft Office, Internet Explorer and so forth is being utilized by nearly each expert withinside the global. Microsoft become based via way of means of Bill Gates and Paul Allen on 4, April, 1975, and it has improved its marketplace proportion via way of means of diversifying its offerings from the running gadget marketplace to different numerous software program merchandise. (alerty, n.d.)

In Microsoft Corporation there are almost every Job Role that are in the IT market due to the larger scale of Employee Base. But getting into this Company Is so hard since most of the IT Professionals have a dream to work for a Company like this. (alertify, n.d.)

- II. **IBM** - International Business Machine (IBM) is an American MNC and is operational in greater than a hundred and fifty countries. The business enterprise became set up firstly as a computing recording business enterprise however became later renamed as IBM (International Business Machines) in 1924. IBM headquarter is found in Armonk, New York, and it has a various portfolio of software program services and products which they're similarly increasing to cater to the modern-day developing wishes of current and new users. Major regions from which it earns its sales are cloud computing, cognitive computing, statistics analytics and the Internet of things, IT infrastructure and security. IBM's sales are developing at a double-digit rate.

Mr Arvind Krishna is the Present CEO of the IBM Company. There are plenty of Job Titles available at the IBM Careers and Mostly are Front-End and Back- End Developing jobs that mentioned on the above Organizations. (alertify, n.d.)

- III. **ACCENTURE** - Accenture has been indexed withinside the fortune international 500 groups and is one in every of the most important Information Technology groups. It is a international control consulting organization that gives expert offerings like strategy, consulting, generation and operations offerings. Accenture began out because the enterprise and tech consulting organization of an accounting organization which turned into named as Arthur Andersen. In the 12 months 1989, it separated and Andersen Consulting followed its contemporary call Accenture this means that accessory of the future. The employer has a headcount of extra than 699,000 personnel worldwide. Accenture has numerous enterprise gadgets and all enterprise gadgets have precise contributions to Accenture's common sales generation. Accenture consulting presents mobility offerings and virtual advertising and marketing analytics. Company generation specializes in studies and development, generation answer implementation, and generation labs for rising technologies. (alertify, n.d.)

- IV. **ORACLE** - Oracle corporations headquarter is placed in Redwood Shores California and it's miles one of the famend American MNC. Oracle has the second one maximum sales withinside the software program enterprise after Microsoft with an worker base of round 1,35,000. The enterprise is widely recognized for its ERP solutions, database improvement and control, deliver chain control software program and Customer dating control software program. Oracle has a extensive purchaser base having greater than 400,000 clients throughout the globe and a presence throughout a extensive form of industries in greater than one hundred fifty countries. Oracle is diagnosed for its person pleasant programs and constantly attempts to put off the complexities from the programs they construct like programs starting from information middle operations to cloud programs which may be street block for enterprise innovation, speed, flexibility, manageability, reliability, protection and engineering. Oracle turned into on 4th Rank in Top IT groups withinside the international too.

Mr Larry Ellison is the CEO of the Oracle Organization. (alertify, n.d.)



- V. **SAP** - Oracle corporation's headquarter is placed in Redwood Shores California and it's miles one of the famend American MNC.Oracle has the second one maximum sales withinside the software program enterprise after Microsoft with an worker base of round 1,35,000. The enterprise is widely recognized for its ERP solutions, database improvement and control, deliver chain control software program and Customer dating control software program. Oracle has a extensive purchaser base having greater than 400,000 clients throughout the globe and a presence throughout a extensive form of industries in greater than one hundred fifty countries. Oracle is diagnosed for its person pleasant programs and constantly attempts to put off the complexities from the programs they construct like programs starting from information middle operations to cloud programs which may be street block for enterprise innovation, speed, flexibility, manageability, reliability, protection and engineering. Oracle turned into on 4th Rank in Top IT groups withinside the international too. (alertify, n.d.)

4. Refer to the web sources and briefly explain the job roles of the following job titles.

- a) **Software Engineer** - This role includes analysing and modifying existing software, and designing, building, and testing end-user applications to meet user requirements. All of this is done through software programming languages. This role also focuses on the complex, large-scale software systems that make up the core systems of an organization. (roberthalf, n.d.)
- b) **Software Architect** – A software architect is responsible for the overall planning and organization of a software system. They are responsible for creating high-level design and framing standards. Also, decide which tools, platforms, and programming standards are right for your project. (Medushevska, 2022)
- c) **Business Analyst** – BAs are responsible for creating new models that support business decisions by working closely with financial reporting and IT teams to establish initiatives and strategies to improve importing and to optimize costs. (targetjobs, n.d.)
- d) **Quality Assurance Engineer** – Quality Assurance Engineers (QA Engineers) play a key role in the software development and distribution lifecycle. QA engineers ensure that all aspects of a product meet the organization's established quality standards and requirements before release. (u-tor, n.d.)
- e) **Project Manager** – A project manager is responsible for planning, procuring, executing, and completing a project. The project manager is responsible for the entire project and is responsible for all tasks such as: B. Project scope, project team leadership, and resources allocated to the project. (betterteam, n.d.)
- f) **Software Support Engineer** - Software support engineers specialize in working closely with corporate software development teams to solve complex software problems and provide technical support to customers. Her responsibilities include answering calls and correspondence, addressing problems and concerns, troubleshooting, providing step-by-step solutions, and directing customers to other

services when necessary. In addition, software support engineers can participate in software development procedures to ensure the quality and efficiency of software and applications by creating test structures and identifying and eliminating errors. (bestaccreditedcolleges, 2022)

5. Refer to Chapter 1 of the above reference e-book (one of them) and explain the following terms.

a) **Purpose of using Variables in C Language -**

A variable is simply the name of an area of memory that a program can manipulate. All variables in C have a specific type that determines the size and layout of the variable memory. The range of values that can be stored in that memory. A set of operations that can be applied to variables.

Variable names can consist of letters, numbers, and underscores. Must start with a letter or underscore. It is case sensitive because C is case sensitive. (Brian W. Kernighan, 1978)

a) **Purpose of Operators and types of Operators –**

Operators are the basis of all programming languages. Operators can be defined as symbols that help perform certain mathematical and logical calculations on their operands. In other words, we say that operators operate on their operands.

C Language has many built-in operators, which can be divided into 6 types:

- i. **Arithmetic Operators** – These Operators are used to perform tasks like Arithmetic and Mathematical Operation on their Operands.
- ii. **Relational Operators** - These Operators are used to compare the Values of two Operators.
- iii. **Logical Operators** – Logical Operators are used to perform bit-level operations on operands. Operators are first transformed at the bit level and then the computation is performed on the operands.
- iv. **Bitwise Operators** - Bitwise Operators are used to perform bit-level operations on operands. Operators are first transformed at the bit level and then the computation is performed on the operands.
- v. **Assignment Operators** – The assignment operator is used to assign a value to a specific variable. The left operand of an assignment operator is a variable and the right operand of an assignment operator is a value.

- vi. **Other Operators** – Apart from the operators mentioned above, there are several other operators that can be used in C to perform specific tasks.

The Below Figure Shows Some Examples for the Above-Mentioned Operators

### Operators in C

Operators	Type
++, --	Unary operator
+, -, *, /, %	Arithmetic operator
<, <=, >, >=, ==, !=	Relational operator
&&,   , !	Logical operator
&,  , <<, >>, -, ^	Bitwise operator
=, +=, -=, *=, %=	Assignment operator
?:	Ternary or conditional operator

Unary operator ←

Binary operator ←

Ternary operator ←

Figure 1

(geeksforgeeks, n.d.)