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| **C/C++/C#** | | | | |
| **Year** | **No.** | **Question** | **Marks** | **Answers** |
| 18/19  (Main) | 3 | The programming language C++ was mainly influenced by the two languages C and SIMULA 67. How? | 10 | The C++ Programming Language goes back to 1979 when **Bjarne Stroustrup** was doing this Ph. D thesis. He had the opportunity to work with a language which mainly designed for simulations called Simula. The Simula67 language (1967) which is a variant that Stroustrup was working on is considered as the 1st Object-Oriented programming languages with concepts such as objects, class, inheritance, etc. Nevertheless, it was too slow for practical use. Sometime later, he started working on “C with Classes” the predecessor of C++, was meant to be a superset of the C Language. C is an Imperative Procedural Programming Language and it was initially developed at Bell Labs by Dennis Ritchie between 1972 and 1973 to make utilities running on Unix. C Programming language gained popularity during the 1980’s. His primary goal was to add Object-Orientation to C Language by including concepts such as classes, basic inheritance, inlining, default function arguments and strong type checking added to the features that C language already had. The name of the language C with Classes was changed to C++ in 1983. Along with the modification of the name, many new features were added and the most notable were [virtual functions](http://www.cplusplus.com/doc/tutorial/polymorphism/#virtual), [function overloading](http://www.cplusplus.com/doc/tutorial/functions2/#function_overload), references with the & symbol and single-line comments using two forward slashes.  <http://www.cplusplus.com/info/history/>  [https://en.wiki pedia.org/wiki/Simula](https://en.wikipedia.org/wiki/Simula) |
| 18/19  SEM 2 | 2 | Assume that you work in a software development company and that you are asked to develop a distributed software solution that integrates software written in Java and software written in C++; discuss at least two strategies [5 marks each] to facilitate this. | 10 | Strategy in C++  Strategy is a behavioral design pattern that turns a set of behaviors into objects and makes them interchangeable inside original context object.  Usage examples: The Strategy pattern is very common in C++ code. It’s often used in various frameworks to provide users a way to change the behavior of a class without extending it.  Identification: Strategy pattern can be recognized by a method that lets nested object do the actual work, as well as the setter that allows replacing that object with a different one.  https://refactoring.guru/design-patterns/strategy/cpp/example  Strategy in Java  Strategy is a behavioral design pattern that lets you define a family of algorithms, put each of them into a separate class, and make their objects interchangeable.  Usage examples: The Strategy pattern is very common in Java code. It’s often used in various frameworks to provide users a way to change the behavior of a class without extending it.  https://refactoring.guru/design-patterns/strategy |
| 18/19  SEM 2 | 3 | Explain or discuss the following statement: “the programming language C# was introduced as a strategic, commercial decision”. | 10 | During the 90s, Microsoft was riding high on the Windows monopoly. It was claimed by the U.S. Department of Justice that a Microsoft strategy at the time was “Embrace, extend, and extinguish”, meaning that they would embrace a successful technology, bundle it with Windows, and then extend it so that it became better, but also incompatible with the original. This would initiate customers to use Windows and Microsoft products. When Sun introduced Java in 1995, Microsoft saw the potential in the language and its network and attempted to implement that strategy. Bill Gates introduced his own JVM implementation with IE3, so he started improving it beyond the Java standard. Sun sued Microsoft in October 1997 for the incomplete implementation of the Java 1.1 standard, which forced Microsoft to discontinue its implementation. Rather than move to Sun's JVM and offer Sun significant influence in the Windows world, Microsoft has decided to eliminate Sun by introducing its language and platform and effectively killing Java on Windows. They brought on board the famous programming language designer Anders Hejlsberg, who had already had experience of changing and improving existing programming languages, and assigned him the task of creating a "Better Java". Thus, were born C # and .NET framework.  <https://www.forbes.com/sites/quora/2018/03/02/why-did-microsoft-create-c/#399e71ab70f3> |
| 17/18  (Main) | 2 | The programming language C evolved from the programming language B by adding “types”. Furthermore, C++ then introduced user defined ‘abstract data types”. Clarify the difference by providing examples of such “types” [5 marks] and “abstract data types” [5 marks]. | 10 | C introduced types  C++ introduced Abstract Data Types  C language supports 2 different type of data types:   1. **Primary data types**: These are fundamental data types in C namely integer(int), floating point(float), character(char) and void. 2. **Derived data types**: Derived data types are nothing but primary datatypes but a little twisted or grouped together like **array**, **stucture**, **union** and **pointer**. These are discussed in details later.   An **abstract data type** (or ADT) is a class that has a defined set of operations and values. In other words, you can create the starter motor as an entire abstract data type, protecting all of the inner code from the user. When the user wants to start the car, they can just execute the start() function. In programming, an ADT has the following features:   * An ADT doesn't state how data is organized, and * It provides only what's needed to execute its operations   An ADT is a prime example of how you can make full use of data abstraction and data hiding.  One of the most common ADTs are the Array, List, Map, Queue, Set, Stack, Table, Tree, and Vector  <https://stackoverflow.com/questions/10267084/what-is-adt-abstract-data-type> |
| 16/17 | 2 | In 1979, Bjarne Stroustrup developed the programming language C++. Discuss how C++ was influenced by the two languages C [5 marks] and SIMULA 67 [5 marks] | 10 | Same answer as 18/19 (Main) Questions 3 |
| 15/16 | 2) b. | Briefly describe the Bjarne Stroustrup’s reasoning to develop C++ from the programming language C [10 marks]. | 10 | **Definition - What does C++ Programming Language mean?**  C++ is a general-purpose object-oriented programming (OOP) language, developed by Bjarne Stroustrup, and is an extension of the C language. It is therefore possible to code C++ in a "C style" or "object-oriented style." In certain scenarios, it can be coded in either way and is thus an effective example of a hybrid language.  C++ is considered to be an intermediate-level language, as it encapsulates both high- and low-level language features. Initially, the language was called "C with classes" as it had all the properties of the C language with an additional concept of "classes." However, it was renamed C++ in 1983.  C++ gives programmers a high level of control over system resources and memory.  The language was updated 3 major times in 2011, 2014, and 2017 to C++11, C++14, and C++17.  <https://en.wikipedia.org/wiki/C%2B%2B>  <https://programmingvital.blogspot.com/2019/02/C-and-C-plus-plus-Introduction-and-History-of-CPP-Programming-Language.html> |
| 15/16 | 2)  c. | What was a main driver to develop C# in the year 2000 even though the similar programming language Java already existed since 1995? [7 marks] | 7 | **C#** is a modern object-oriented programming language developed in 2000 by Anders Hejlsberg at Microsoft as a rival to Java (which it is quite similar to). It was created because Sun, (later bought by Oracle) did not want Microsoft to make changes to [Java](https://medium.com/sololearn/a-nice-cup-of-code-is-java-the-programming-language-for-you-4e1fe211bfaf), so Microsoft chose to create their own language instead. C# has grown quickly since it was first created, with extensive support from Microsoft helping it to gain a large following; it is now one of the most popular programming languages in the world.  <https://hackr.io/blog/c-sharp-vs-java>  <https://www.educba.com/java-vs-c-sharp/> |
| 15/16 | 2) b. | How did SIMULA 67 influence the development of C++ by Bjarne Stroustrup? [5 marks] | 5 | Same answer as 18/19 (Main) Questions 3 |
| 14/15 | 2)  a. | When Bjarne Stroustrup developed C++ he drew ideas from the two programming languages SIMULA 67 and C. In what way? [8 marks] | 8 | Same answer as 18/19 (Main) Questions 3 |
| 12/13 | 1 | How did the two programming languages C and SIMULA 67 influence the development of C++? | 4 | Same answer as 18/19 (Main) Questions 3 |
| 11/12 | 11 | Denis MacAlistair Ritchie (1941-2011) developed the programming language C based on its predecessor language B. What new feature has been added to C which was not present in B? | 2 | **From Lec Slides**  **A Genealogy: B (1968?)**  Designed by Ken Thompson at Bell Labs, New Jersey.  http://www.computerhistory.org/fellowawards/hall/ken-thompson/  “Unfortunately, it [BCPL] was too big to run on the 4K Unix machines, so Thompson made B, which was nearly exactly the same, although it was an interpreter, instead of a compiler.” From: http://www.princeton.edu/~hos/frs122/unixhist/finalhis.htm  “… it is BCPL squeezed into 8Kbytes of memory and filtered through Thompson's brain.”  (Dennis Ritchie, http://sites.fas.harvard.edu/~lib113/reference/c/c\_history.html )  **A Genealogy: C (1972)**  Designed by Dennis Ritchie at Bell Labs:  https://www.youtube.com/watch?v=umF6SNYaJNw  C closely related to the development of Unix operating system (and then Linux etc).  “**B can be thought of as C without types”**  <http://sites.fas.harvard.edu/~lib113/reference/c/c_history.html>  Possible Answers   * It supplied the types *int* and *char* * The programming language C evolved from the programming language B by adding “types” |
| 10/11 | 3 | Object Oriented Programming is about sending messages from one object to another object. How is the “sending of messages” implemented in main-stream 3rd generation languages such as C, C#, or Java? | 2 | Messages passed using “Methods”  <https://en.wikipedia.org/wiki/Method_(computer_programming)>  <https://www.webopedia.com/TERM/M/message_passing.html>  <https://rmod.inria.fr/archives/papers/Moug03aOOPALOOPSLA.pdf> |
| 10/11 | 8 | Which new programming paradigm was introduced in the programming language SIMULA 67? | 2 | Object Oriented Programming |
| 09/10 | 2 | Which new programming paradigm has been introduced in the programming language SIMULA 67? | 2 | Object Oriented Programming |