Module 1 (CORE JAVA)

Assignment

Introduction to Java

QUE 1: History of Java.

Java is a widely-used programming language that was developed by James Gosling and his team at Sun Microsystems in the early 1990s. The project, initially called "Greentalk" and later "Oak," aimed to create a language for digital devices like set-top boxes and televisions. However, it was eventually recognized for its potential in internet programming.

QUES 2: Features of Java (Platform Independent, Object-Oriented, etc.) .

Java works on different platforms like Windows, Mac, Linux etc. Java is an object oriented language which gives a clear structure to program and allows code to reuse. Java is close to c or c++ so it makes programmer to switch from c or c++ to java or vice verse. Java is high in performance and secure language.

QUES 3: Understanding JVM, JRE, and JDK .

JVM is java virtual machine = It is a platform independent execution that converts Java byte code to machine language and executes. Jvm allows java byte code to run on all software and describe as compile once and run everywhere.

JRE is Java run time environment use of JRE is to run the program without this any program cannot run.

It contains jvm, class libraries and other files to run the program.

JDK is java development kit it's a tool needed to develop a java program. E.g. is Javac , java, Javap , jdb , Javadoc etc.

QUES 4 : Java Program Structure (Packages, Classes, Methods).

Package Statement - first statement of any program is package statement . it tells complier that classes belong to this package.

Classes – There are more than one or more classes, we have to declare with class keyword along with class name.

Methods – There are main class in which there is main method , which is important part of program. In main method we can create object of classes and using that we can call methods or variables .

Data Types, Variables, and Operators .

QUES 5: Primitive Data Types in Java (int, float, char, etc.) .

Primitive data types - includes byte, short, int, long, float, double, boolean and char

QUES 6: Variable Declaration and Initialization .

In java one must declare the variable before use , we need to declare its name and its type .

e.g. int number , here int is a type and number is a variable

String name , here also String is type and name is a variable .

Boolean bool, here also Boolean is type and bool is a variable .

Etc.

Initialization means to assign a value to the declared variable.

e.g. int number = 0;

QUES 7: Operators: Arithmetic, Relational, Logical, Assignment, Unary, and Bitwise .

Operators are used to perform operation on values.

Arithmetic operator = used for common operation like (+ , - , * , / , %) .

Relational operator is used to perform relation or comparison between variables e.g. (== , !=, > , < , >= , <=).

Logical operator are used for true or false like e.g (&& and , ||or , ! not)

Assignment operator is use to assign values e.g. (= , += , -= * = , / = etc)

Bitwise operator (~ Unary bitwise complement , << Signed left shift , >> Signed right shift , >>> Unsigned right shift , & Bitwise AND , ^ Bitwise exclusive OR , | Bitwise inclusive OR)

QUES 8: Type Conversion and Type Casting.

In java we have different data types and all acquires different space while storing in memory . when we assign a value to any of datat type and it if is compatible with the other one then it will convert automatically but it is not compatible then we need to cast .

Automatic convertion in which both are compatible with each other , or we assign value for smaller one and convert it into bigger one .

Type casting is done using casting operator .assigning value of one data type to other . there are two type . 1. Widening - lower data type to higher data type . 2. Narrow. – higher to lower data type .

Control Flow Statements

QUES 9: If-Else Statements , Switch Case Statements

IF STATEMENT – This are basic decision making statement it is used to decide whether certain statement will execute or not .

IF ELSE STATEMENT - This will allow to select from any one of the given option .

SWITCH CASE –Thus is a substitute for long if statement that compare a variable to several integer value.

QUES 10: Loops (For, While, Do-While)

LOOP - This allow us to execute a statement multiple times based on a condition.

FOR LOOP - it is repetition control structure , it will continue till the condition is true . it is entry control loop.

WHILE LOOP – it is also entry control loop and condition will be checked at the entry.

DO WHILE LOOP – It is exit control loop. It will execute once whether the condition is true or false.

QUES 11: Break and Continue Keywords

BREAK – The break statement is used inside loop or switch statement. If compiler finds the break statement compiler will abort the loop, or used as go to statement.

CONTINUE- The continue statement is also used inside loop. When compiler finds the continue statement inside a loop, compiler will skip all the following statements in the loop and resume the next loop iteration

Classes and Objects

QUES 12: Defining a Class and Object in Java

Everything in java is associated with object and classes. Object which has its own state and behavior. Ex. Pen, paper etc.

Collection of object is called class. Ex. human body.

QUES 13: Constructors and Overloading .

CONSTRUCTOR - It is a member function which initializes a class. A constructor has the same name as the class itself and no return type. A constructor is called automatically.

OVERLOADING- when there is a two or more method in same class having the same name but number of parameter are different is called method overloading.

QUES 14: Object Creation, Accessing Members of the Class

To create an object of any class , specify the class name, followed by the object name, and use the keyword new.

Ex. Tops tp = new tops();

In java classes consist of various variable and member so to access that we need to declare them and to access them we have different access modifier.

QUES15 : this Keyword

'This' keyword is use as reference in method. Where variables are declare as global.

Methods in Java

Ques 16: Defining Methods , Method Parameters and Return Types.

A **method** is a block of code which only runs when it is called. It is also called as define once and use many times.

Method parameter are variables declared inside the parenthesis.

Return types are primitive data types instead of void.

Ques 17: Method Overloading.

More than one method having the same name but different parameter.

It is also known as compile time polymorphism.

Ques 18: Static Methods and Variables

A static method belongs to the class rather than the object of a class.

The static variable can be used to refer to the common property of all objects.

Object-Oriented Programming (OOPs) Concepts

QUES 19: Basics of OOP: Encapsulation, Inheritance, Polymorphism, Abstraction

Features of OOP

object : Any entity which has own state and behavior e.g pen pencil,paper etc.

class: collection of objects e.g human body

encapsulation: Wrapping up of data or binding of data e. g capsule

inheritance: When one object acquire all the properties and behavior of parent class e.g parents son

polymorphism: Many ways to perform anything ex: roads

abstraction: Hiding internal details and showing functionalities e.g tv remote

QUES 20: Inheritance: Single, Multilevel, Hierarchical

Inheritance is of 5 types java support 4 and multiple is not supported in java

Single inheritance is where child can inherit the property of parents class using extends keyword.

Multilevel , where more than one class are there and they extended to each sub class using extend keyword .

Hierarchical where one parents is extended to many child or sub classes. it is a combination of single and multiple inheritance .

QUES 21 : Method Overriding and Dynamic Method Dispatch

Overriding means same method name and same parameter. Also known as run time polymorphism.

Dynamic method dispatch means is a mechanism which resolve at run time and method overriding is the best way we can do this .

Constructors and Destructors

QUES 22 : Constructor Types (Default, Parameterized) , Copy Constructor (Emulated in Java)

Constructor in java is a method that is use to initialize objects. Constructor name is always as same as class name and it does not have return type.

DEFAULT CONSTRUCTOR - A constructor which does not have parameter .

PARAMETRIZED CONSTRUCTOR - A constructor which has a specific number of parameters is called a parameterized constructor.

COPY CONSTRUCTOR - copy constructor is passed with another object which copies the data available from the passed object.

QUES 23: Constructor Overloading

In java it is allowed to have more than one constructor in a class with different parameters.

QUES 24: Garbage Collection

It is a automatic process in JVM that removes object which is no longer needed and save memory allocation.

Arrays and Strings

QUES 25 : One-Dimensional and Multidimensional Arrays.

An array is a container which contain collection of object which has fixed values and same data type.

One dimentional array

EX. Int singledim[] = new int[5];

Multidimentional array

EX. Int multiarray[][] = new int [4][5];

QUES 26: String Handling in Java: String Class, StringBuffer , StringBuilder

String is a immutable class which means it is constant and cannot be change once created.

Stringbuffer is mutable and it is thread safe . it includes various string ability such as append

delete, insert etc.

Stringbuilder is also a mutable , and as it is not safe for multi thread but has a good performance in single thread make is more favorable to use.

QUES 26: Array of Objects

Array of an object is when first object is created of any class and then array is created

EX. Class name[] obj ;

Obj = new classname[5];

QUES 27 : String Methods (length, charAt, substring, etc.)

The string class has built in string method which we can use on string.

Length – gives the length of the specific string

charAt – return the character at specific index.

compareTo- compare the two string etc.

Inheritance and Polymorphism

QUES 28: Inheritance Types and Benefits .

Inheritance means one object can acquire all the property and behavior of a parent object.

Inheritance is of 5 types –

Single – one parent class and one child class

Multiple – not supported in java we can us but using interface

Multilevel – one parent many child

Hierarchical- one parent and multiple child

Hybrid – combination of any two inheritances.

Benefits – Inheritance allows to acquire all the property and behavior of parent class to child class , it allow to reuse the code and maintains hierarchy .

QUES 29: Super Keyword and Method Hiding

Super keyword is to refer parent class object.

Method hiding means subclass and superclass both same have the same method name but it is static .it is compile time rather than run time.

Interfaces and Abstract Classes

QUES 30: Abstract Classes and Methods

Abstraction is process of hiding details and showing of functionality.

Abstract classes has abstract method only and we cannot create an object of that class to excess that we need to inherit it with other class.

Abstract method can only be used in abstract class and it does not have body.

QUES 31: Interfaces: Multiple Inheritance in Java

Another way of using a abstraction is through interface similar to abstraction , where method does not have body. To inherit the interface with other class we use word IMPLEMENT instead of extend.

QUES 32: Implementing Multiple Interfaces

To implement multiple interface we can separate it by comma.

Packages and Access Modifiers

QUES 33 : Java Packages: Built-in and User-Defined Packages

Package is a folder in a file directory,

The package which is already given is called built in.

We can use built in package to write a code .

The package which is created by user is called user define package.

QUES 34: Access Modifiers: Private, Default, Protected, Public

Access modifiers are of 4 type

Private : it can be accessed within the class not outside the class .

Protected : it can be used inside the class as well as inside the package but we cannot use outside the package if we want to use then we need to use by child class.

Public : we can use anywhere in class , in package and outside the package also.

Default : if we don’t use any access modifier specifically then it assume it as default and that can be use within the package .

QUES 35: Importing Packages and Class path

We can import a package using IMPORT keyword for EX. Java.util.*;

Here java .util contains date , time, number etc classes.

If we want to use any class path then we write

“ import java.util.Scanner;”

Here scanner is a classpath.

Exception Handling

It is very important mechanism in java to avoid runtime error and maintain the normal flow of application.

QUES 36: Types of Exceptions: Checked and Unchecked.

CHECKED - Checked exceptions are the exceptions that are checked at compile-time. This means that the compiler verifies that the code handles these exceptions either by catching them or declaring them in the method signature using the throws keyword. Examples of checked exceptions include: ex. IO exception, classnot found exception etc.

UNCHECKED – It is known as run time exception. These errors usually occur due to programming error or code logic error. Ex arthematic exception etc.

QUES 37: try, catch, finally, throw, throws

TRY - The "try" keyword is used to specify a block where we should place an exception code. It means we can't use try block alone. The try block must be followed by either catch or finally.

CATCH – It is use to catch the exception in the code, it is always use after try block, it alone cannot be used and it is followed by finally.

FINALLY- These block is use to execute the necessary code whether the exception is handled or not.

THROW- These is use to throw exception.

THROWS - It is use to declare a exception.

QUES 38: Custom Exception Classes

Custom exception means we can create our own exception. According to our need we can define a class for exception and throw it into the program.

Multithreading Theory:

QUES 39: Introduction to Thread

A thread is a very light weighted process in which we able to run multiple process altogether ,it is smallest part of the process . it allows program to run efficiently. To perform complicated task in the background without effecting main program, we use threads. All the threads are independent and have their own path.

QUES 40: Creating Threads by Extending Thread Class or Implementing Runnable Interface.

Thread can be created by two ways either by extending a class or implementing Runnable interface

QUES 41: Thread Life Cycle

Thread Lifecycle :

1) init

2) start

3) run

4) stop

5) destroy

QUES 42 : Synchronization and Inter-thread Communication

Synchronization means at a given particular time only one thread can access to avoid the wrong result.

Inter thread communication means when multi thread needs to synchronized with each other to perform.

There are few keyword to use is wait(), notify() , etc.

File Handling

QUES 43: Introduction to File I/O in Java (java.io package)

File handling is a important part of any application. Java has certain methods for files to write,read ,update or delete. The File class from the java.io package, allows us to work with files. To use the File class, create an object of the class, and specify the filename or directory name:

QUES 44: FileReader and FileWriter Classes

File reader is use to read the data given in file.Using a scanner class .

File writer is to write a file which user have create .

We use class name and write() method to write the file. And giving a specific path to save the file. Using try catch block so that if any exeption is found then it can be found.

QUES 45: BufferedReader and BufferedWriter

Java BufferedReader class is used to read the text from a character-based input stream. It can be used to read data line by line by readLine() method. It makes the performance fast. It inherits the Reader class.

Java BufferedWriter class is used to provide buffering for Writer instances. It makes the performance fast. It inherits Writer class. The buffering characters are used for providing the efficient writing of single arrays, characters, and strings.

QUES 46: Serialization and Deserialization

Serialization in Java is a mechanism of writing the state of an object into a byte-stream.

The reverse operation of serialization is called deserialization where byte-stream is converted into an object.

Java Input/Output (I/O)

QUES 47: Streams in Java (InputStream, OutputStream)

In java input stream is to read data from a source .

In java ouput stream is to write a data to a file or any other destination

QUES 48: Reading and Writing Data Using Streams

To read data from a file, you can use FileInputStreamfor byte streams or FileReaderfor character streams.

To write data to a file, you can use FileOutputStream for byte streams or FileWriter for character streams.

QUES 49: Handling File I/O Operations

File handling is very important part of any programming language as file handling enables us to store the output of of any program in a file and allow to perform certain operation on it.