## Question 1. What is Serialization in java?

**Answer**. Let's start by understanding what is Serialization, it's most basic question which **you will have to answer almost in each and every java interview**. Serialization is process of converting **object into byte stream**.

Serialized object (byte stream) can be:
>Transferred over network.
>Persisted/saved into file.
>Persisted/saved into database.
Once, object have have been transferred over network or persisted in file or in database, we could deserialize the object and retain its state as it is in which it was serialized.

## Question 2. How do we Serialize object, write a program to serialize and deSerialize object and persist it in file (Important)?

**Answer**. **You must be able to write Serialization code** to impress interviewer. In order to serialize object our class needs to implement **java.io.Serializable** interface. Serializable interface is **Marker interface** i.e. it **does not have any methods** of its own, **but** it **tells Jvm that object has to converted into byte stream**.

**SERIALIZATION>**
Create object of ObjectOutput and give it's reference variable name oout and call writeObject() method and pass our employee object as parameter [**`oout.writeObject(object1)`** ]

```
OutputStream fout = new FileOutputStream("ser.txt");
ObjectOutput oout = new ObjectOutputStream(fout);
System.out.println("Serialization process has started, serializing employee objects...");
oout.writeObject(object1);
```

**DESERIALIZATION>**
Create object of ObjectInput and give it's reference variable name oin and call readObject() method [**`oin.readObject()`** ]

```
InputStream fin=new FileInputStream("ser.txt");
ObjectInput oin=new ObjectInputStream(fin);
System.out.println("DeSerialization process has started, displaying employee
objects...");
Employee emp;
emp=(Employee)oin.readObject();
```

## Question 3 . Difference between Externalizable and Serialization interface (Important)?

**Answer**. Here comes the time to **impress interviewer** by differentiating Serializable and Externalizable use.

| | **SERIALIZABLE** | **EXTERNALIZABLE** |
|---|---|---|
| Methods | It is a **marker** interface it doesn't have any method. | It's not a marker interface.<br>It has method's called **writeExternal()** and **readExternal()** |
| Default Serialization process | **YES**, Serializable provides its own **default serialization process**, we just need to implement Serializable interface. | **NO**, we need to override **writeExternal()** and **readExternal()** for serialization process to happen. |
| Customize serialization process | We **can** customize **default serialization process** by **defining following** methods in our class >**readObject()** and **writeObject()**<br>**Note**: We are not overriding these methods, we are defining them in our class. | Serialization process is completely customized<br>We need to **override** Externalizable interface's **writeExternal()** and **readExternal()** methods. |
| Control over Serialization | It provides **less control** over Serialization as it's not mandatory to define **readObject()** and **writeObject()** methods. | Externalizable provides you **great control** over serialization process as it is important to override **writeExternal()** and **readExternal()** methods. |
| Constructor call during **deSerialization** | Constructor is **not** called during deSerialization. | Constructor **is called** during deSerialization. |

## Question 4. How can you customize Serialization and DeSerialization process when you have implemented Serializable interface (Important)?

**Answer**. Here comes the quite **challenging question**, where you could prove how strong your Serialization concepts are.We can customize **Serialization** process by defining **writeObject()** method & **DeSerialization** process by defining **readObject()** method.

Let's customize **Serialization** process by defining **writeObject()** method :

```
    private void writeObject(ObjectOutputStream os) {
        System.out.println("In, writeObject() method.");
        try {
               os.writeInt(this.id);
               os.writeObject(this.name);
        } catch (Exception e) {
               e.printStackTrace();
        }
  }
```

We have serialized id and name manually by writing them in file.

Let's customize **DeSerialization** process by defining **readObject()** method :

```
    private void readObject(ObjectInputStream ois) {
            System.out.println("In, readObject() method.");
            try {
                    id=ois.readInt();
                    name=(String)ois.readObject();
            } catch (Exception e) {
                    e.printStackTrace();
            }
    }
```
We have DeSerialized id and name manually by reading them from file.

## Question 5. Wap to explain how can we Serialize and DeSerialize object by implementing Externalizable interface (Important)?

**Answer**. For serializing object by implementing Externalizable interface, we need to override writeExternal() and readExternal() for serialization process to happen.

For **Serialization** process override **writeExternal()** method & for **DeSerialization** process by override **readExternal()** method.

Let's customize **Serialization** process by overriding **writeExternal()** method :

```
    public void writeExternal(ObjectOutput oo) throws IOException {
            System.out.println("in writeExternal()");
            oo.writeInt(id);
            oo.writeObject(name);
    }
```
We have serialized id and name manually by writing them in file.

Let's customize **DeSerialization** process by overriding **readExternal()** method :

```
    public void readExternal(ObjectInput in) throws IOException, ClassNotFoundException
 {
            System.out.println("in readExternal()");
            this.id=in.readInt();
            this.name=(String)in.readObject();
    }
```
We have DeSerialized id and name manually by reading them from file.

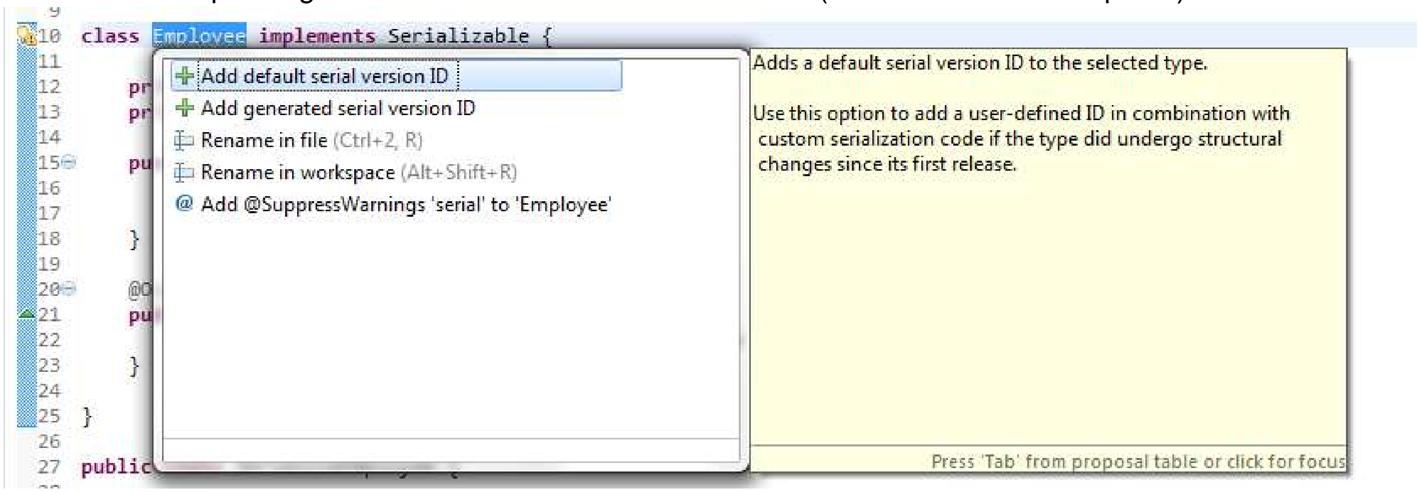
## Question 6. How can you avoid certain member variables of class from getting Serialized?

**Answer**. Mark member variables as **static** or **transient**, and those member variables will no more be a part of Serialization.

## Question 7. What is serialVersionUID?

**Answer**. The serialization at runtime associates with each serializable class a version number, called a serialVersionUID, which is used during deserialization to verify that the sender and receiver of a serialized object have loaded classes for that object that are compatible with respect to serialization.

We can use eclipse to generate serialVersionUID for our class (as done in below snapshot)



```
10  class Employee implements Serializable {
11
12      pr
13      pr
14
15      pu
16
17
18      }
19
20      @O
21      pu
22
23      }
24
25  }
26
27  public
```

Add default serial version ID
Add generated serial version ID
Rename in file (Ctrl+2, R)
Rename in workspace (Alt+Shift+R)
@ Add @SuppressWarnings 'serial' to 'Employee'

Adds a default serial version ID to the selected type.

Use this option to add a user-defined ID in combination with custom serialization code if the type did undergo structural changes since its first release.

Press 'Tab' from proposal table or click for focus

How to avoid **warning** 'The serializable class Employee does not declare a static final serialVersionUID field of type long' ?
Again answer is we can use eclipse to generate serialVersionUID for our class (as mentioned in above screenshot, click on warning button on left in line 10).

## Question 8. What will be impact of not defining serialVersionUID in class (Important)?

**Answer**. This is one my favourite question, i am going to discuss it in a very detailed manner.
serialVersionUID is used for **version control of object**.
If we don't define serialVersionUID in the class, and any **modification** is made in class, then we **won't be able to deSerialize our class** because **serialVersionUID generated by java compiler for modified class will be different from old serialized object**. And deserialization process will end up throwing **java.io.`InvalidClassException`** (because of serialVersionUID mismatch)

Let's frame another question by twisting few words in it.

*If you have serialized a class & then added few fields in it and then deserialize already serialized version of class, how can you ensure that you don't end up throwing* ***`InvalidClassException`****?*
**>**Simply we need to define **serialVersionUID** in class.

When we Deserialize class ( class which has been modified after Serialization and also class **doesn't declare SerialVersionUID**) `InvalidClassException` is thrown.

When we Deserialize class ( class which has been modified after Serialization and also class **declare SerialVersionUID**) its gets DeSerialized **successfully**.

Let’s discuss this interesting topic in detail - Impact of not defining serialVersionUID in class and avoiding `InvalidClassException`

## Question 9. What are compatible and incompatible changes in Serialization process?

**Answer**.

**Compatible Changes :** Compatible changes are those changes which **does not affect** deSerialization process even if class was updated after being serialized (provided serialVersionUID has been declared)

- **Adding new fields** - We can add new member variables in class.
- **Adding writeObject()/readObject() methods** - We may add these methods to customize serialization process.
- **Removing writeObject()/readObject() methods** - We may remove these methods and then default customization process will be used.
- **Changing access modifier of a field** - The change to access modifiers i.e. public, default, protected, and private have no effect on the ability of serialization to assign values to the fields.
- **Changing a field from static to non static OR changing transient filed to non transient field**. - it’s like addition of fields.

**InCompatible Changes :** InCompatible changes are those changes which affect deSerialization process if class was updated after being serialized (provided serialVersionUID has been declared)

- **Deletion of fields.**
- **Changing a nonstatic field to static or non transient field to transient field. -** it’s equal to deletion of fields.
- **Modifying the writeObject() / readObject() method** - we must not modify these method, though adding or removing them completely is compatible change.

## Question 10. What if Serialization is not available, is any any other alternative way to transfer object over network?

**Answer**.

>We can can convert **JSON** to transfer the object. JSON is helpful in stringifying and de stringifying object.
>**Hibernate** (ORM tool) helps in persisting object as it in database and later we can read persisted object.
>We can convert object into **XML** (as done in web services) and transfer object over network.

## Question 11. Why static member variables are not part of java serialization process (Important)?

**Answer**. Serialization is applicable on objects or primitive data types only, but **static** members are **class level variables**, therefore, **different object's of same class have same value for static member**.
So, serializing static member will consume unnecessary space and time.
Also, if modification is made in static member by any of the object, it won't be in sync with other serialized object's value.

## Question 12. What is significance of transient variables?

**Answer**. Serialization is not applicable on transient variables (it helps in saving time and space during Serialization process), we **must mark all rarely used variables as transient**. We can initialize transient variables during deSerialization by customizing deSerialization process.

## Question 13. What will happen if one the member of class does not implement Serializable interface (Important)?

**Answer**. This is classy question which will check your in depth knowledge of Serialization concepts. If any of the member does not implement Serializable than NotSerializableException is thrown. Now, let's see a program.

## Question 14. What will happen if we have used List, Set and Map as member of class?

**Answer**. This question which will check your in depth knowledge of Serialization and Java Api's. ArrayList, HashSet and HashMap implements Serializable interface, so if we will use them as member of class they will get Serialized and DeSerialized as well. Now, let's see a program.

## Question 15. Is constructor of class called during DeSerialization process?

**Answer**. This question which will check your in depth knowledge of Serialization and constructor chaining concepts. It depends on whether our object has implemented Serializable or Externalizable.
If **Serializable** has been implemented - constructor is **not called** during DeSerialization process.
But, if **Externalizable** has been implemented - constructor **is called** during DeSerialization process.

DETAILED DESCRIPTION : Is constructor of class called during DeSerialization process

## Question 16 . Are primitive types part of serialization process?

**Answer**. **Yes**, primitive types are part of serialization process. Interviewer tends to check your basic java concepts over here.

## Question 17. Is constructor of super class called during DeSerialization process of subclass (Important)?

**Answer**. Again your basic java concepts will be tested over here. It is depends on whether our superclass has implemented Serializable or not.
If superclass **has implemented Serializable** - constructor **is not called** during DeSerialization process.
If superclass has **not implemented Serializable** - constructor **is called** during DeSerialization process.

DETAILED DESCRIPTION : Is constructor of super class called during DeSerialization process of sub class

## Question 18. What values will int and Integer will be initialized to during DeSerialization process if they were not part of Serialization?

**Answer**. int will be initialized to 0 and Integer will be initialized to null during DeSerialization (if they were not part of Serialization process).

## Question 19. How you can avoid Deserialization process creating another instance of Singleton class (Important)?

**Answer**. This is another classy and very important question which will check your in depth knowledge of Serialization and Singleton concepts. I'll prefer you must understand this concept in detail. We can simply use **readResove()** method to return same instance of class, rather than creating a new one.

Defining readResolve() method ensures that we don't break singleton pattern during DeSerialization process.

```
  private Object readResolve() throws ObjectStreamException {
       return INSTANCE;
  }
```

Also define readObject() method, rather than creating new instance, assign current object to INSTANCE like done below :

```
  private void readObject(ObjectInputStream ois) throws
IOException,ClassNotFoundException{
        ois.defaultReadObject();
        synchronized (SingletonClass.class) {
         if (INSTANCE == null) {
               INSTANCE = this;
         }
        }
  }
```

DETAILED DESCRIPTION : Avoid Deserialization process creating another instance of Singleton class

## Question 20. Can you Serialize Singleton class such that object returned by Deserialization process is in same state as it was during Serialization time (regardless of any change made to it after Serialization) (Important)?

**Answer**. It's another very important question which will be important in testing your Serialization and Singleton related concepts, you must try to understand the concept and question in detail.
**YES**, we can Serialize Singleton class such that object returned by Deserialization process is in same state as it was during Serialization time (regardless of any change made to it after Serialization)

Defining readResolve() method ensures that we don't break singleton pattern during DeSerialization process.

```
  private Object readResolve() throws ObjectStreamException {
       return INSTANCE;
  }
```

Also define readObject() method, rather than creating new instance, assign current object to INSTANCE like done below :

```
  private void readObject(ObjectInputStream ois) throws
IOException,ClassNotFoundException{
        ois.defaultReadObject();
        synchronized (SingletonClass.class) {
         if (INSTANCE == null) {
               INSTANCE = this;
         }
        }
  }
```

DETAILED DESCRIPTION : Can you Serialize Singleton class such that object returned by Deserialization process is in same state as it was during Serialization time

## Question 21. Purpose of serializing Singleton class OR purpose of saving singleton state?

**Answer**. Let's take example of our laptop, daily eod we need to shut it down, but rather than shutting it down hibernate (save state of laptop) is better option because it enables us to resume at same point where we leaved it, like wise serializing singleton OR saving state of Singleton can be very handy.

## Question 22. How can subclass avoid Serialization if its superClass has implemented Serialization interface (Important)?

**Answer**. If superClass has implemented Serializable that means subclass is also Serializable (**as subclass always inherits all features from its parent class**), for avoiding Serialization in sub-class we can **define writeObject()** method and **throw NotSerializableException()** from there as done below.

```
private void writeObject(ObjectOutputStream os) throws NotSerializableException {
        throw new NotSerializableException("This class cannot be Serialized");
}
```

DETAILED DESCRIPTION : Can subclass avoid Serialization if its superClass has implemented Serialization interface

## You might be given code snippets in interviews and asked to give output -

## Question 23. Find output of following code :

```
package serDeser6ListSetMap;

import java.io.FileInputStream;
import java.io.FileOutputStream;
import java.io.IOException;
import java.io.InputStream;
import java.io.ObjectInput;
import java.io.ObjectInputStream;
import java.io.ObjectOutput;
import java.io.ObjectOutputStream;
import java.io.OutputStream;
import java.io.Serializable;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.HashSet;
import java.util.List;
import java.util.Map;
import java.util.Set;
/*Author : AnkitMittal  Copyright- contents must not be reproduced in any form*/
class MyClass implements Serializable {

    private static final long serialVersionUID = 1L;
    private List<Integer> list;
    private Set<Integer> set;
    private Map<Integer,Integer> map;

    public MyClass(List<Integer> list, Set<Integer> set,
                  Map<Integer, Integer> map) {
           super();
           this.list = list;
           this.set = set;
           this.map = map;
    }

    @Override
    public String toString() {
            return "MyClass [list=" + list + ", set=" + set + ", map=" + map + "]";
    }


}

public class SerializeEmployee {

    public static void main(String[] args) {

           List<Integer> list=new ArrayList<Integer>();
           list.add(2);
           list.add(3);
           Set<Integer> set=new HashSet<Integer>();
           set.add(4);
           set.add(5);
           Map<Integer, Integer> map=new HashMap<Integer,Integer>();
           map.put(6, 34);
           map.put(7, 35);
           MyClass object1 = new MyClass(list,set,map);

           try {
                  OutputStream fout = new FileOutputStream("ser.txt");
                  ObjectOutput oout = new ObjectOutputStream(fout);
                  System.out.println("Serialization process has started, serializing
objects...");
                  oout.writeObject(object1);
                  fout.close();
         oout.close();
         System.out.println("Object Serialization completed.");


                  //DeSerialization process >


                  InputStream fin=new FileInputStream("ser.txt");
                  ObjectInput oin=new ObjectInputStream(fin);
                  System.out.println("\nDeSerialization process has started, displaying
objects...");
                  MyClass object=(MyClass)oin.readObject();
                  System.out.println(object);
                  fin.close();
         oin.close();
         System.out.println("Object DeSerialization completed.");

           } catch (IOException | ClassNotFoundException  e) {
                  e.printStackTrace();
           }

    }

}
```

**Answer**. Here intention of interviewer will be to find out whether you know that list, set and map can be serialized or not.

```
/*OUTPUT
```

```
Serialization process has started, serializing objects...
Object Serialization completed.

DeSerialization process has started, dispalying objects...
MyClass [list=[2, 3], set=[4, 5], map={6=34, 7=35}]
Object DeSerialization completed.

*/
```

## Question 24.  Find output of following code  (Important):

```
package SerDeser10memberNotSer;

import java.io.FileOutputStream;
import java.io.IOException;
import java.io.ObjectOutput;
import java.io.ObjectOutputStream;
import java.io.OutputStream;
import java.io.Serializable;

class MyClass {}

/*Author : AnkitMittal  Copyright- contents must not be reproduced in any form*/
class Employee implements Serializable {

    private static final long serialVersionUID = 1L;
    private Integer id;
    private MyClass myClass ;

    public Employee(Integer id) {
           this.id = id;
           myClass=new MyClass();
    }

    @Override
    public String toString() {
           return "Employee [id=" + id + "]";
    }

}

public class SerializeDeser {

    public static void main(String[] args) {

           Employee object1 = new Employee(8);

           try {
                  OutputStream fout = new FileOutputStream("ser.txt");
                  ObjectOutput oout = new ObjectOutputStream(fout);
                  System.out.println("Serialization process has started, serializing
objects...");
                  oout.writeObject(object1);
                  System.out.println("Object Serialization completed.");
                  fout.close();
         oout.close();
```

```
            } catch (IOException  e) {
                   e.printStackTrace();
            }

     }

}
```

**Answer**. Here intention of interviewer will be to find out whether you know that if any of the member does not implement Serializable than NotSerializableException is thrown.

```
/*OUTPUT

Serialization process has started, serializing objects...
java.io.NotSerializableException: SerDeser10memberNotSer.MyClass
    at java.io.ObjectOutputStream.writeObject0(Unknown Source)
    at java.io.ObjectOutputStream.defaultWriteFields(Unknown Source)
    at java.io.ObjectOutputStream.writeSerialData(Unknown Source)
    at java.io.ObjectOutputStream.writeOrdinaryObject(Unknown Source)
    at java.io.ObjectOutputStream.writeObject0(Unknown Source)
    at java.io.ObjectOutputStream.writeObject(Unknown Source)
    at SerDeser10memberNotSer.SerializeConstructorCheck.main(SerializeConstructorCheck.java:42)

*/
```