EX.NO : 1	**Installation of Hadoop Framework**

1. Prerequisites
- Java JDK 8 or 11 installed (recommend JDK 1.8.x).
- Environment Variables: JAVA_HOME, HADOOP_HOME, Path updated correctly.
- Use a short path (e.g., C:\Progra~1\Java\jdk1.8.0_271) if the path has spaces.

2. Download & Extract Hadoop
- Get Hadoop 3.3.6 from the Apache official website.
- Extract the archive to a directory like C:\hadoop-3.3.6

3. Configure Environment Variables
- Set JAVA_HOME and HADOOP_HOME
- Update PATH to include %JAVA_HOME%\bin and %HADOOP_HOME%\bin
- Edit hadoop-env.cmd: set JAVA_HOME path

4. Configure Hadoop XML Files
- core-site.xml: set fs.defaultFS to hdfs://localhost:9000
- hdfs-site.xml: set name and data dirs, dfs.replication to 1
- mapred-site.xml: set mapreduce.framework.name to yarn
- yarn-site.xml: enable mapreduce_shuffle

5. Install winutils.exe
- Download matching winutils.exe from a trusted GitHub source.
- Copy it to %HADOOP_HOME%\bin

6. Format HDFS
- Run `hdfs namenode -format`

7. Start Hadoop Daemons
- Run `start-dfs.cmd` and `start-yarn.cmd` from the sbin folder
- Use `jps` to check processes

8. Verify via Web UI
- NameNode: http://localhost:9870/
- ResourceManager: http://localhost:8088/

9. Common HDFS Commands
- hdfs dfs -ls /
- hdfs dfs -mkdir /user/hduser
- hdfs dfs -put local.txt /user/hduser/
- hdfs dfs -get /user/hduser/local.txt ./
- hdfs dfs -cp, -mv, -rm

10. Troubleshooting
- JAVA_HOME errors: use short path
- winutils.exe not found: verify binary and Path
- Connection refused: check services and port configs