

SEPM EXP NO: 5

TO BUILD THE PIPELINE OF JOBS USING MAVEN / GRADLE / ANT IN JENKINS, CREATE A PIPELINE SCRIPT TO TEST AND DEPLOY AN APPLICATION OVER THE TOMCAT SERVER

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Theory:

1. Introduction to Jenkins and CI/CD

Jenkins is an open-source automation server used for continuous integration and continuous deployment (CI/CD). It helps automate the software development lifecycle by building, testing, and deploying applications.

1.1 CI/CD Concepts

- Continuous Integration (CI): Automatically integrates code changes into a shared repository and runs tests.
- Continuous Deployment (CD): Automates the process of deploying applications to production or staging environments.

1.2 Tools Used

- Jenkins – Automation server.
- Maven/Gradle/Ant – Build automation tools.
- Tomcat – A web server for deploying Java applications.

2. Installing and Configuring Jenkins

1. Download and Install Jenkins:

- Download from Jenkins official site.
- Install and start the Jenkins service.
- Access Jenkins at <http://localhost:8080/>.

2. Install Required Plugins:

- o Go to Manage Jenkins > Plugin Manager.
- o Install Pipeline, Maven Integration, and Deploy to Container plugins.

3. Creating a Jenkins Pipeline

Jenkins pipelines define a series of automated steps for building, testing, and deploying applications.

3.1 Steps to Create a Pipeline

1. Open Jenkins Dashboard and click on New Item.
2. Select Pipeline and provide a project name.
3. Click OK and navigate to the Pipeline section.
4. Write a Pipeline script (Declarative or Scripted) to define the build and deployment process.

4. Writing a Jenkins Pipeline Script

The following script builds a Java application using Maven and deploys it to Tomcat:

```
groovy CopyEdit pipeline {    agent any    stages    {        stage('Checkout Code') {            steps {                git                'https://github.com/your-repository.git'            }        }        stage('Build with Maven') {            steps {                sh 'mvn clean package'            }        }        stage('Deploy to Tomcat') {            steps {                deploy adapters:                [tomcat8(credentialsId: 'tomcat-cred', path: '', url:
```

'http://yourtomcat-server:8080')], war:

'**/*.war'

```
    }  
  }  
}  
}
```

5. Configuring Jenkins for Deployment

1. Configure Tomcat Server:

- o Install Tomcat and start the server.
- o Set up a user with deployment privileges in conf/tomcatusers.xml: xml CopyEdit

```
<role rolename="manager-gui"/>
```

```
<role rolename="manager-script"/>
```

```
<user username="admin" password="admin" roles="manager-gui,manager-script"/> o
```

Restart Tomcat.

2. Set Up Jenkins Credentials:

- o Go to Manage Jenkins > Credentials.
- o Add a username/password credential for Tomcat deployment.

3. Run the Pipeline in Jenkins:

- o Click Build Now to execute the pipeline.
- o Verify the deployment at <http://your-tomcat-server:8080/your-app>.

Example 1 :

Creating a job:

Start building your software project


Create a job





Naming the job and setting it as freestyle:


Enter an item name


» Required field


**Freestyle project**
Classic, general-purpose job type that checks out from up to one SCM, executes build steps serially, followed by post-build steps like archiving artifacts and sending email notifications.

**Pipeline**
Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.

**Multi-configuration project**
Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.

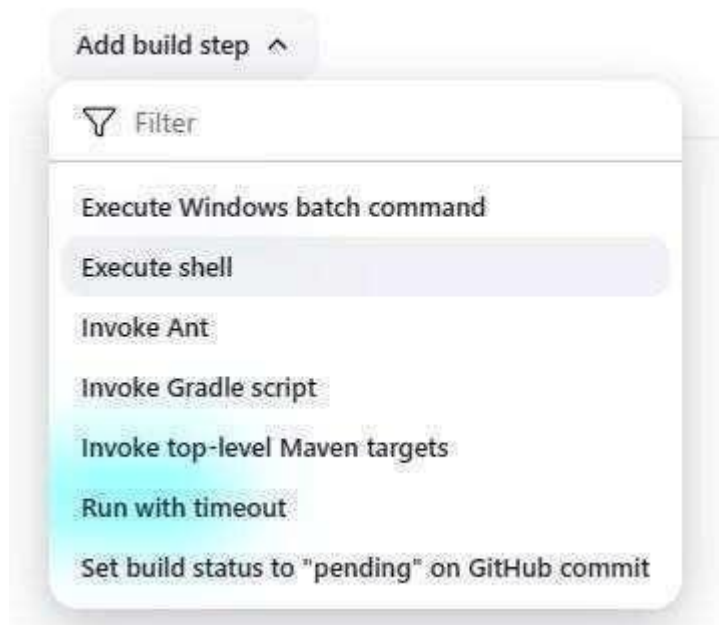
**Folder**
Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different folders.

**Multibranch Pipeline**
Creates a set of Pipeline projects according to detected branches in one SCM repository.

**Organization Folder**
Creates a set of multibranch project subfolders by scanning for repositories.

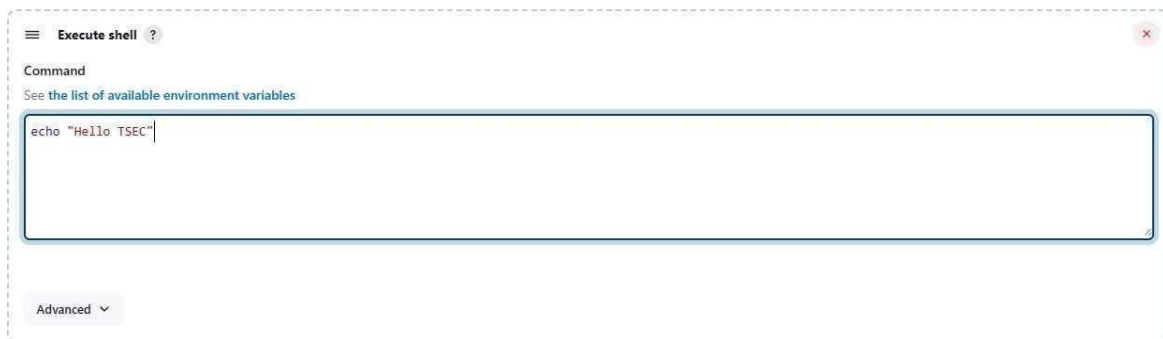
Selecting build type as “Execute shell”:

Build Steps



Entering a simple command for the shell execution:

Build Steps



Applying and saving the project configuration:



Building the project:



Console output (after building):



Example 1.2: Taking parameters through files Contents of script

example1.cmd:

A screenshot of a Windows command prompt window titled 'example1.cmd'. The window has a menu bar with 'File', 'Edit', and 'View'. The command prompt shows the following text: 'echo off' followed by 'echo "Hello %1... Your address is %2"'. The status bar at the bottom indicates 'Ln 1, Col 1' and '47 characters'. The window is set to '100%' zoom, 'Windows (CRLF)' line endings, and 'UTF-8' encoding.

Executing script example1.cmd on the terminal:

A screenshot of a Windows command prompt window showing the execution of the script. The prompt is 'C:\Users\AI&DS 202>'. The user enters 'Microsoft Windows [Version 10.0.22621.3296] (c) Microsoft Corporation. All rights reserved.' which results in an error: ''Microsoft' is not recognized as an internal or external command, operable program or batch file.' The user then enters 'C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPM>example1.cmd' which results in 'The system cannot find the path specified.' The user then enters 'C:\Users\AI&DS 202>"Hello... Your address is "' which results in ''Hello... Your address is "' is not recognized as an internal or external command, operable program or batch file.' The user then enters 'C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPM>example1.cad Tanishq' which results in 'The system cannot find the path specified.' The user then enters 'C:\Users\AI&DS 202>"Hello Tanihsq... Your address is "' which results in ''Hello Tanihsq... Your address is "' is not recognized as an internal or external command, operable program or batch file.' The user then enters 'C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPM>example1.cmd Tanishq Girgaon "Helle Tanishq... Your address is Gi rgaon"' which results in 'The system cannot find the path specified.'

Modifying the Jenkins project to execute the script while supplying required parameters:

Build Steps

Execute Windows batch command ?

Command

See the list of available environment variables

```
C:\Admin\Academics\TSEC\Start3\SEPM\example1.cmd Siddhant Goregaon
```

Advanced ▾

Add build step ▾

Console output after building the modified project:

Status

Changes

Console Output

View as plain text

Edit Build Information

Delete build #4

Previous Build

✓ Console Output

Started by user Siddhant Chetlur
Running as SYSTEM
Building in workspace C:\ProgramData\Jenkins\jenkins\workspace\Example1
[Example1] \$ cd /c call C:\WINDOWS\TEMP\jenkins7075095818165161156.bat

C:\ProgramData\Jenkins\jenkins\workspace\Example1>C:\Admin\Academics\TSEC\Start3\SEPM\example1.cmd Siddhant Goregaon
"Hello Siddhant... Your address is Goregaon"
Finished: SUCCESS

Example 2 Example 2.1: Running a Java program under

Jenkins Creating a simple Java program:

```
example2.java
File Edit View
class Main {
    public static void main(String args[])
    {
        System.out.println("Hello World");
    }
}
Ln 1, Col 1 98 characters 100% Windows (CRLF) UTF-8
```

Compiling and running the program on the terminal:

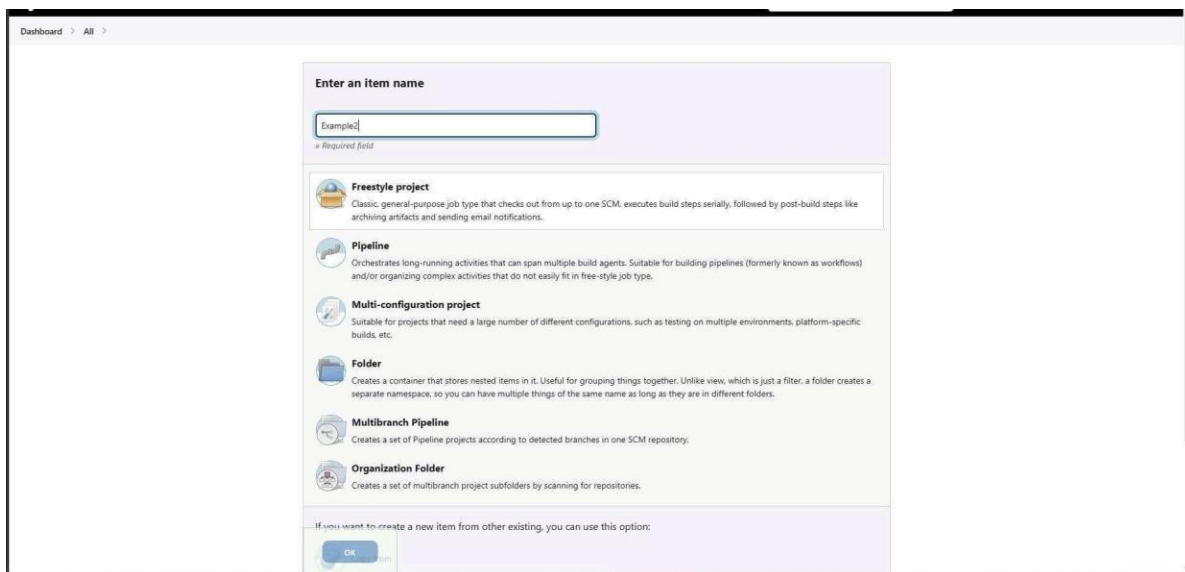
```
Command Prompt
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Admin\Academics\TSEC\Start3\SEPM>javac example2.java

C:\Admin\Academics\TSEC\Start3\SEPM>java example2.java
Hello World

C:\Admin\Academics\TSEC\Start3\SEPM>
```

Creating a new freestyle project:



Configure new project:

Build Steps

≡ Execute Windows batch command ?

Command

See the list of available environment variables

```
javac C:\Admin\Academics\TSEC\Start3\SEPH\example2.java
java C:\Admin\Academics\TSEC\Start3\SEPM\example2.java
```

Advanced ▾

Add build step ▾

Console output after building:



Console Output

```
Started by user Siddhant Chetlur
Running as SYSTEM
[EnvInject] - Loading node environment variables.
Building in workspace C:\ProgramData\Jenkins\jenkins\workspace\Example2
[Example2] $ cmd /c call C:\WINDOWS\TEMP\jenkins15296462404998614135.bat

C:\ProgramData\Jenkins\jenkins\workspace\Example2>javac C:\Admin\Academics\TSEC\Start3\SEPH\example2.java

C:\ProgramData\Jenkins\jenkins\workspace\Example2>java C:\Admin\Academics\TSEC\Start3\SEPM\example2.java
Hello World


C:\ProgramData\Jenkins\jenkins\workspace\Example2>exit: 0
Finished: SUCCESS
```

Example 3 Example 3.1: Parameterise build


Creating a new freestyle project:

Enter an item name


[» Required field](#)

**Freestyle project**


Classic, general-purpose job type that checks out from up to one SCM, executes build steps serially, followed by post-build steps like archiving artifacts and sending email notifications.

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**Multi-configuration project**


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**Multibranch Pipeline**

Creates a set of Pipeline projects according to detected branches in one SCM repository.

**Organization Folder**

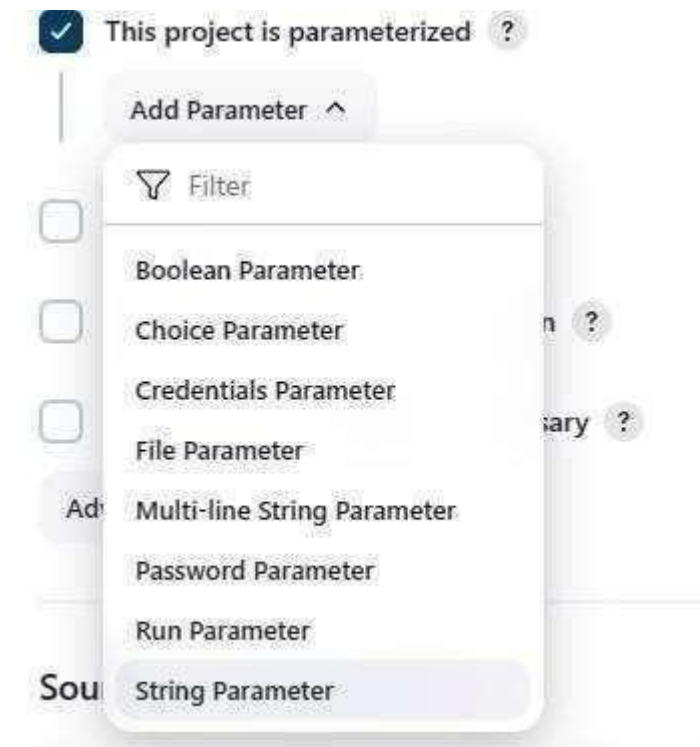
Creates a set of multibranch project subfolders by scanning for repositories.

If you want to create a new item from other existing, you can use this option:

OK

Copy from

Enabling parameterisation and adding a String parameter:



Configuring the string parameter as Fname:

A screenshot of the 'String Parameter' configuration form. The form has a title bar with a hamburger menu icon, the text 'String Parameter', and a close button. It contains three main input fields: 'Name' with the value 'Fname', 'Default Value' (empty), and 'Description' (empty). Below these fields, there is a 'Plain text' label and a 'Preview' link. At the bottom, there is a checkbox labeled 'Trim the string' which is currently unchecked. The entire form is enclosed in a dashed border.

Adding a choice parameter and configuring it as City with the following choices:

Choice Parameter ?

Name ?

Choices ?

Bandra

Kalyan

Dombivali

Churchgate

Thane

Dadar

Description ?

Plain text

Preview

Creating a script which takes 2 arguments for name and city:

```
C:\Users\AI&DS 202>Microsoft Windows [Version 10.0.22631.3155] (c) Microsoft Corporation. All rights reserved.
'Microsoft' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPH>example3.cnd
The system cannot find the path specified.

C:\Users\AI&DS 202>Hello your name is and your city is
'Hello' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPH example3.cmd Tanishq
The system cannot find the path specified.

C:\Users\AI&DS 202>Hello your name is Tanishq and your city is
'Hello' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPM>example3.cmd Tansishq Bandra
The system cannot find the path specified.

C:\Users\AI&DS 202>Hello your name is Tanishq and your city is Bandra
'Hello' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPH|
```

Configuring build steps:

Build Steps

Execute Windows batch command ?

Command

See the list of available environment variables

Advanced

Add build step

Entering parameters for build:

Project Example3

This build requires parameters:

Fname

City

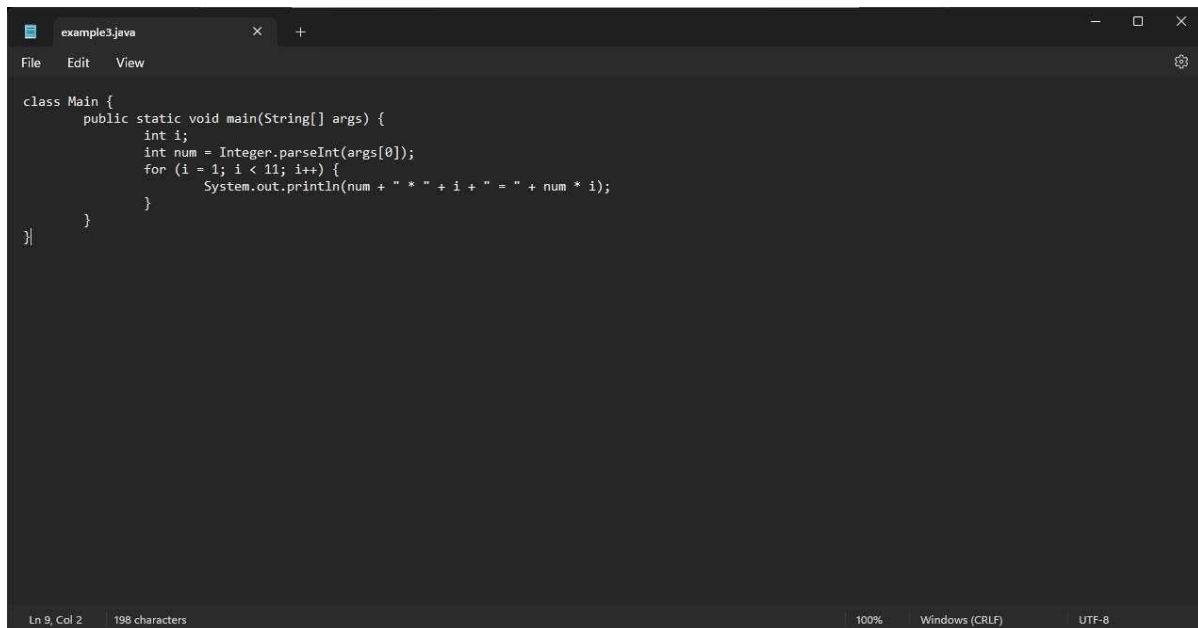
Console output after building:

✓ Console Output

```
Started by user Siddhant Chetlur
Running as SYSTEM
[EnvInject] - Loading node environment variables.
Building in workspace C:\ProgramData\Jenkins\jenkins\workspace\Example3
[Example3] $ cmd /c call C:\WINDOWS\TEMP\jenkins14094536165150986151.bat

C:\ProgramData\Jenkins\jenkins\workspace\Example3>C:\Admin\Academics\TSEC\Start3\SEPM\example3.cmd Siddhant Bandra
Hello your name is Siddhant and your city is Bandra
Finished: SUCCESS
```

Example 3.2: Running a Java program with parameters Creating
a Java program with an input argument:



```
class Main {
    public static void main(String[] args) {
        int i;
        int num = Integer.parseInt(args[0]);
        for (i = 1; i < 11; i++) {
            System.out.println(num + " * " + i + " = " + num * i);
        }
    }
}
```

Testing the program on the terminal:

```
Command Prompt
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Admin\Academics\TSEC\Start3\SEPM>javac example3.java

C:\Admin\Academics\TSEC\Start3\SEPM>java example3.java 4
4 * 1 = 4
4 * 2 = 8
4 * 3 = 12
4 * 4 = 16
4 * 5 = 20
4 * 6 = 24
4 * 7 = 28
4 * 8 = 32
4 * 9 = 36
4 * 10 = 40


C:\Admin\Academics\TSEC\Start3\SEPM>
```

Creating a new freestyle project:


Enter an item name

Example4


» Required field


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Organization Folder

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If you want to create a new item from other existing, you can use this option:

OK

Parameterise the project by adding a string parameter as follows:

☒ This project is parameterized ?

String Parameter ?

Name ?

num

Default Value ?

Description ?

Plain text [Preview](#)

☐ Trim the string ?

Add Parameter ▾

Configure the build steps:

Build Steps

Execute Windows batch command ?

Command

See the list of available environment variables

```
javac C:\Admin\Academics\TSEC\Start3\SEPM\example3.java
java C:\Admin\Academics\TSEC\Start3\SEPM\example3.java %num%
```

Advanced ▾

Add build step ▾

Entering the parameter for the build:

Project Example4

This build requires parameters:

num

▶ Build

Cancel

Console output after building:

✓ Console Output

```
Started by user Siddhant Chetlun
Running as SYSTEM
[EnvInject] - Loading node environment variables.
Building in workspace C:\ProgramData\Jenkins\jenkins\workspace\Example4
[Example4] $ cmd /c call C:\WINDOWS\TEMP\jenkins15119185778823247708.bat

C:\ProgramData\Jenkins\jenkins\workspace\Example4>javac C:\Admin\Academics\TSEC\Start3\SEPM\example3.java

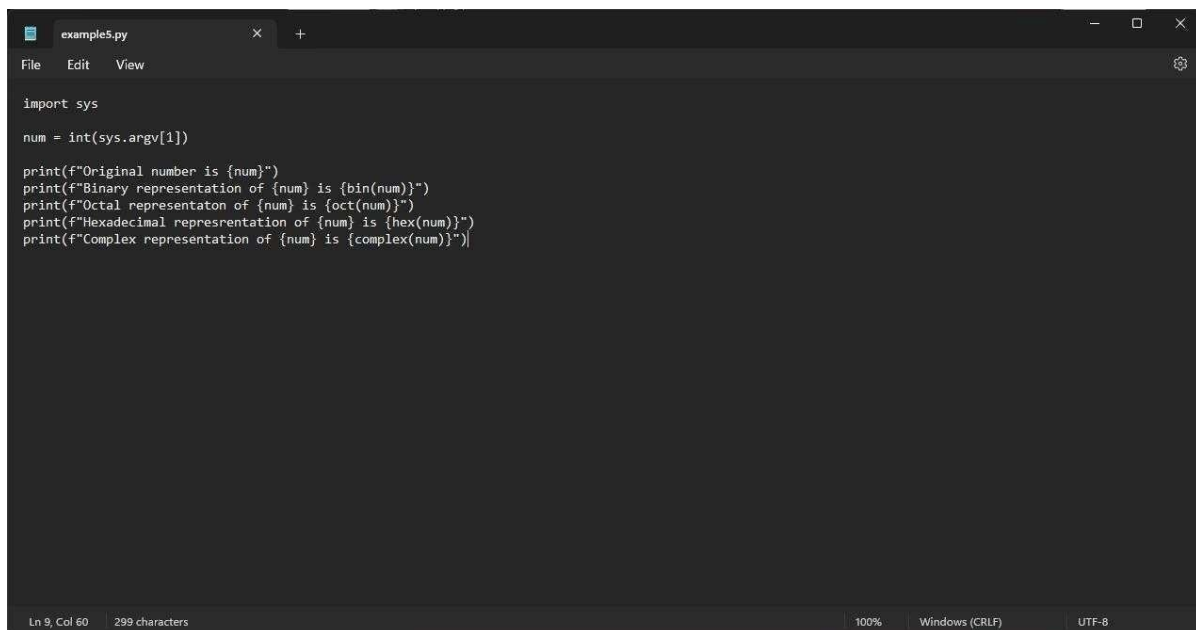
C:\ProgramData\Jenkins\jenkins\workspace\Example4>java C:\Admin\Academics\TSEC\Start3\SEPM\example3.java 25
25 * 1 = 25
25 * 2 = 50
25 * 3 = 75
25 * 4 = 100
25 * 5 = 125
25 * 6 = 150
25 * 7 = 175
25 * 8 = 200
25 * 9 = 225
25 * 10 = 250

C:\ProgramData\Jenkins\jenkins\workspace\Example4>exit 0
Finished: SUCCESS
```

Example 5 Example

5.1: Running a Python program Creating a simple Python

script:



The screenshot shows a code editor window with a single file named 'example5.py'. The code is as follows:

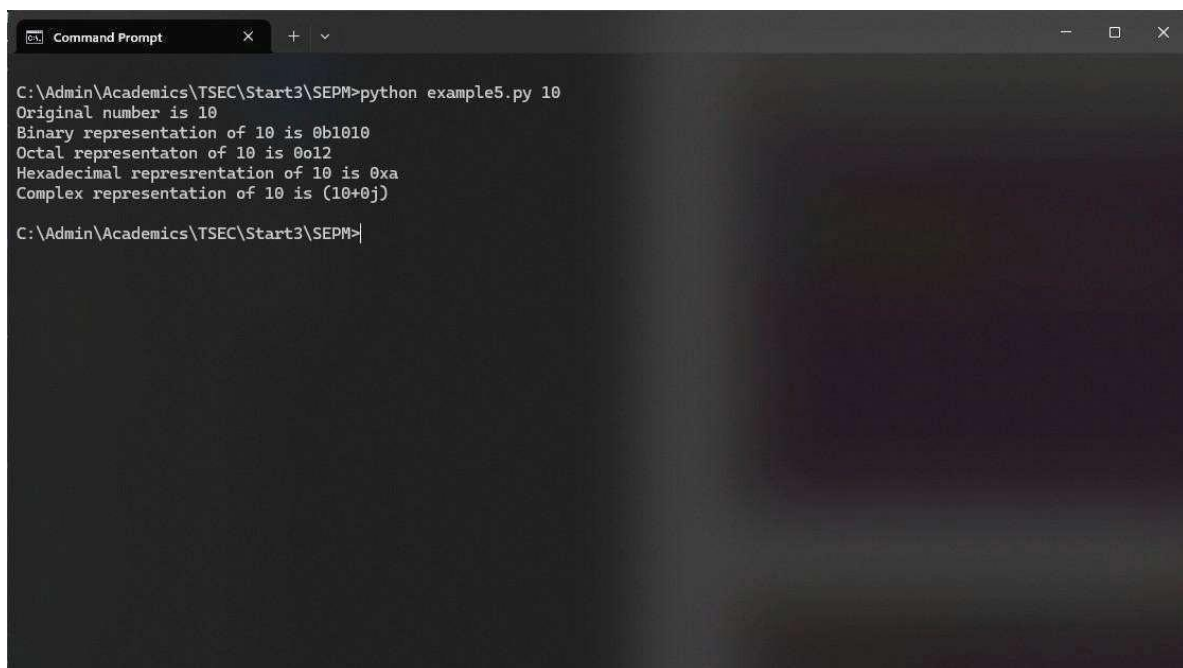
```
import sys

num = int(sys.argv[1])

print(f"Original number is {num}")
print(f"Binary representation of {num} is {bin(num)}")
print(f"Octal representation of {num} is {oct(num)}")
print(f"Hexadecimal representation of {num} is {hex(num)}")
print(f"Complex representation of {num} is {complex(num)}")
```

The status bar at the bottom indicates 'Ln 9, Col 60', '299 characters', '100%' zoom, 'Windows (CRLF)' line endings, and 'UTF-8' encoding.

Running the Python script on the terminal:



The screenshot shows a Windows Command Prompt window. The user has executed the command 'python example5.py 10' from the directory 'C:\Admin\Academics\TSEC\Start3\SEPM'. The output is as follows:

```
C:\Admin\Academics\TSEC\Start3\SEPM>python example5.py 10
Original number is 10
Binary representation of 10 is 0b1010
Octal representation of 10 is 0o12
Hexadecimal representation of 10 is 0xa
Complex representation of 10 is (10+0j)


C:\Admin\Academics\TSEC\Start3\SEPM>
```

Creating a new freestyle project:


Enter an item name

Example5


» Required field


Freestyle project


Classic, general-purpose job type that checks out from up to one SCM, executes build steps serially, followed by post-build steps like archiving artifacts and sending email notifications.


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Organization Folder

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If you want to create a new item from other existing, you can use this option:

OK

Parameterising the project with a string parameter as follows:

☒ This project is parameterized ?

String Parameter ?

Name ?

num

Default Value ?

Description ?

Plain text [Preview](#)

☐ Trim the string ?

Add Parameter ▼

Configuring the build steps:

Build Steps

Execute Windows batch command ?

Command

[See the list of available environment variables](#)

```
python C:\Admin\Academics\TSEC\Start3\SEPM\example5.py %num%
```

Advanced ▾

Add build step ▾

Setting the parameter for the build:

Project Example5

This build requires parameters:

num

▶ Build

Cancel

Console output after building:

✓ Console Output

```
Started by user Siddhant Chetlur
Running as SYSTEM
[EnvInject] - Loading node environment variables.
Building in workspace C:\ProgramData\Jenkins\jenkins\workspace\Example5
[Example5] $ cmd /c call C:\WINDOWS\TEMP\jenkins11157306491994478222.bat

C:\ProgramData\Jenkins\jenkins\workspace\Example5>python C:\Admin\Academics\TSEC\Start3\SEPM\example5.py 10
Original number is 10
Binary representation of 10 is 0b1010
Octal representation of 10 is 0o12
Hexadecimal representation of 10 is 0xa
Complex representation of 10 is (10+0j)

C:\ProgramData\Jenkins\jenkins\workspace\Example5>exit 0
Finished: SUCCESS
```

Conclusion

This experiment demonstrated how to automate a software build and deployment process using Jenkins. By integrating Maven, Gradle, or Ant, we streamlined the compilation and testing of applications, while Jenkins facilitated continuous deployment to a Tomcat server.