Apache Jmeter Tool:

Apache Jmeter is name ka matlab hy k Apache aik foundation ka name hy jo free tools provide karti hy or ab tak 200 plus free tools bana chukii hy tak log easy sy use kar saky to **"APACHE FOUNDATION"** par iska name Apache rakha gya.or Jmeter matlab J means java qk ye tool java par banaya gya hy

JMeter Tool ka kaam kya hai?

JMeter aik tool hai jo check karta hai:

"Jab bohat saare log ek saath website/app use karte hain, to wo sahi kaam karti hai ya nahi?"

Isko hum kehte hain:

- **Performance Testing**
- **Load Testing**
- **Stress Testing**

Jmeter kis liye hota hy website,mobile app, API's ki testing k liye.

✅ Full Explanation: JMeter se kya kya test hota hai?

1. Load Testing

➡️ 100, 500, 1000 ya zyada users ko simulate kar ke dekhna system kaise behave karta hai.

Example:

- 500 users ek saath login kar rahe hain — server slow to nahi ho raha?
- 1000 log checkout kar rahe hain — error to nahi aa rahi?

2. Performance Testing

➡️ Measure karna:

- Server ki **speed** (response time)
- **Throughput** (per second requests)
- **Error rate** (kitne requests fail hue)
- **Latency** (delay kitna hai)

3. Functional Testing (API Testing)

➡️ Yeh test karta hai ke API sahi response dey rahi hai ya nahi.

Example:

- POST /login → kya correct JSON response mil raha hai?

- GET /users → kya list aa rahi hai?

JMeter Postman jaisa ban jaata hai jab tum sirf API functionality test karti ho.

4. Stress Testing

➡️ Limit test — jab tak server **crash** na kare, tab tak users bharte jao.

5. Spike Testing

➡️ Test karo agar ekdum se traffic aajaye (jaise 1000 users in 5 seconds), to system ready hai ya nahi.

6. Database Testing

➡️ Agar tum JDBC driver lagao, to JMeter **direct database query bhi run kar sakta hai**.

Example:

- SELECT * FROM orders WHERE status='pending'

7. File Upload/Download Testing

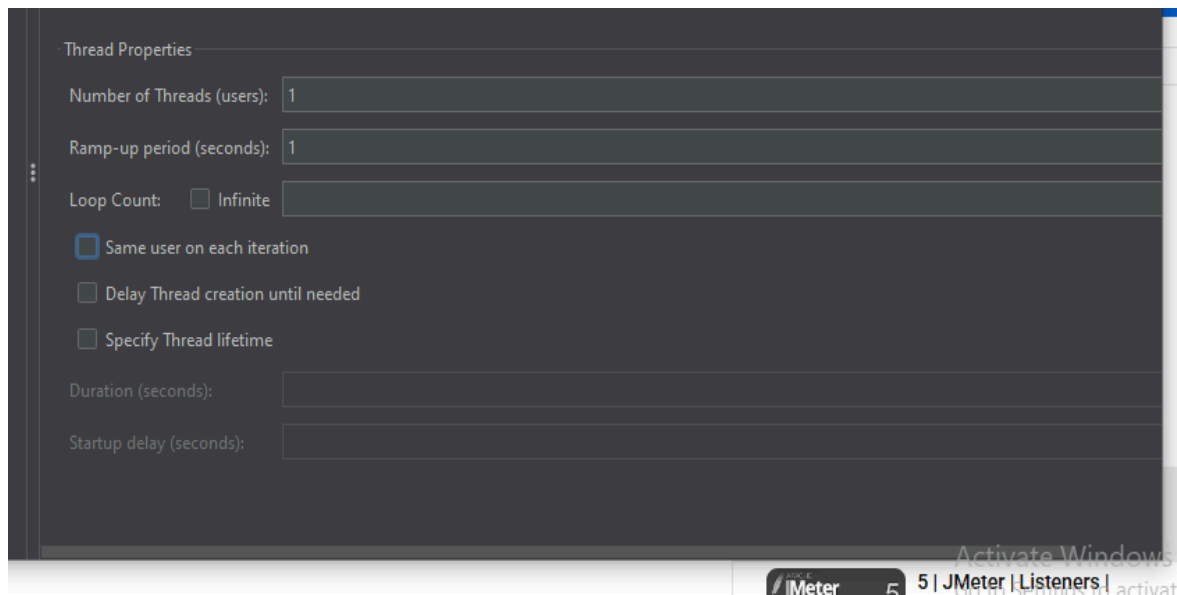➡️ Tum JMeter se test kar sakti ho:

- File upload API kitni fast hai

- Download ka size, speed and delay kitna hai

8. Web Services (SOAP/REST) Testing

➡️ JMeter se:

- REST APIs (GET, POST, PUT, etc.)

- SOAP services bhi test ho sakti hain or meter means measurement karna .

* Testing points for jmeter*:

1- first step

2- Listeners.

3- Assertions.

4- Test script recorder.

5- Blazemeter recorder.

6- How to getdata from a CSV file.

7- Config Elements.

8- CMD

9- HTML reports from GUI and CMD

10- Plugins manager

11- Functions and variables

1- first step:

Same user on each iteration

✅ Check karne ka matlab: Har baar same user repeat hoga.
⬜ Unchecked ka matlab: Har baar naya user samjha jayega.

Example: Socho ek user login karta hai.

- Agar tum chaho ke uska session, cookies, login info waisa ka waisa rahe har baar, to is box ko ✅ check karo.
- Agar tum chaho ke har baar user naye tareeke se login kare, to ise unchecked chhoro.

5. Delay Thread creation until needed

Ye option ye batata hai ke user turant create ho ya jab zarurat ho tabhi.

Simple Example:
Socho tumhare paas 10 users hain. Normally JMeter un sabko start me hi ready kar leta hai.
Lekin agar tum chaho ke sirf tabhi user create ho jab test me uski zarurat ho, to is box ko ✅ check kar sakti ho.

Use case:

- Jab tumhare paas **bohat heavy test** ho aur tum memory bachana chah rahi ho. Lekin beginner ke liye mostly ye unchecked hi rehta hai. Ignore kar do abhi ke liye.

6. Specify Thread Lifetime:

Ye tum define karti ho ke user **kitni der tak** active rahe.

Jab tum is box ko ✅ check karti ho, to neeche 2 fields activate ho jati hain:

Duration (seconds):

*Ye batata hai ke thread (user) **kitni der tak** test chalaye.*
Example:

- Agar tumne duration 60 seconds likha, to thread **1 minute tak** request bhejta rahega.

Startup Delay (seconds):

Ye batata hai ke thread **kitni der ke baad** start ho.
 Example:

- Agar tumne 10 likha, to JMeter thread ko 10 second baad start karega.

2- Listeners

Latency

"Request bhejne ke baad pehli response byte aane tak jo time lagta hai, usay Latency kehte hain."

🎓 **Easy Example:**

Socho tumne JMeter se ek website ko request bheji:
🕐 Request gaya at: 0 sec
🟢 Server ne first byte diya at: 2 sec → **Latency = 2 seconds**
📦 Server ne full response diya at: 5 sec → **Response Time = 5 seconds**

JMeter Me Listener Kya Hota Hai?

Listener ek aisa component hota hai jo tumhare test ka RESULT dikhata hai.
 Jab tum JMeter me koi test run karti ho (jaise API ya website test), Listener tumhe report, graph ya table me dikhata hai ki kya hua — fast tha ya slow, pass hua ya fail, etc.

Examples of JMeter Listeners:

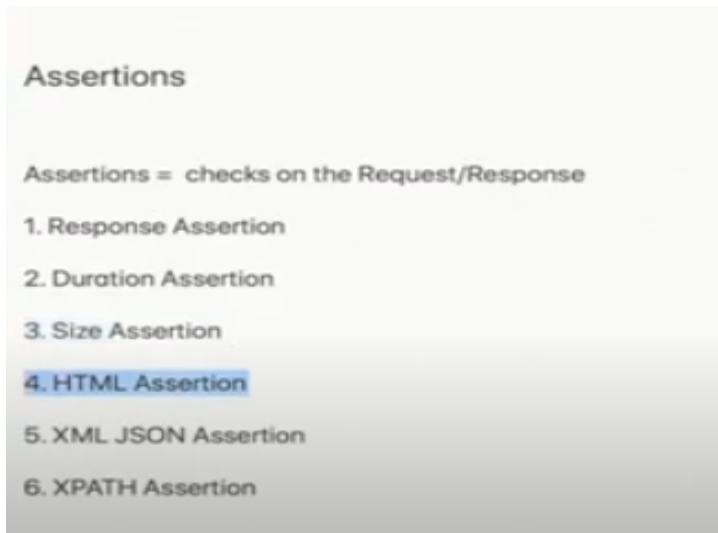| Listener Name	Kya Dikhata Hai?
View Results Tree	Har request ka detail (success/fail, request/response)
Summary Report	Table me total requests, fail, avg time
Graph Results	Line chart me request time
Aggregate Report	Saari summary (min, max, avg, error %)
View Results in Table	Har line me ek request aur uska result

Assertion:

Assertion JMeter me kya hota hai?

Assertion wo hoti hai jo check karti hai ke:"Server ka response sahi aaya ya nahi?"

Ye ek "test condition" hoti hai — agar condition fail ho gayi to JMeter bolega: ❌ *"Test Failed"*.

Assertions means actual result = expected result or not!

HTML Assertion :

HTML Assertion check karta hai ki server se aaya hua HTML page "valid" hai ya nahi.
 Yani us HTML code me koi galti, error, ya invalid tag to nahi.

Error Threshold =   Agar HTML errors ka percentage is value se zyada ho jaye, to request fail ho jati hai

Warning Threshold = Agar errors ka percentage is value se **zyada ho jaye**, to warning aati hai, lekin request fail nahi hot.

JSON Assertion:

JMeter me JSON Assertion ka use tab hota hai jab aapki API ka response JSON format me ho, aur aap us response me kuch specific values ya structure validate karna chahti hain.

🔍 **Purpose:**

JSON Assertion ka kaam hai:
 - Check karna ke API ke response JSON me koi specific key/value hai ya nahi.
 - Ya phir structure sahi hai ya nahi.

Kahan Use Hota Hai?

Agar aapki API ka response kuch aisa ho:

json

```json
{

  "status": "success",

  "message": "User created",

  "user": {

    "name": "Mueza",

    "role": "tester"

  }

}
```

Aur aap check karna chahti hain:

- "status" key exist karti hai?
- "status" ki value "success" hai?
- "user.name" hai aur uski value "Mueza" hai?

To aap JSON Assertion use karein.

JMeter me JSON Assertion Lagane ka Tareeqa:

1. Apni API request ke neeche right-click karo.
2. Add > Assertions > JSON Assertion choose karo.
3. JSON Assertion ke box me:

   - JSON Path expression likho (jaise $.status)
   - Expected Value likho (jaise success)

Test script recorder:

Test Script Recorder ek JMeter ka tool hota hai jo tumhare browser ke actions ko record karta hai,(jaise tumne website open ki, click kiya, form bhara etc.),Aur un actions ko JMeter test case bana deta hai — automatically! 😮

add => Non-test elements => https test script recorder

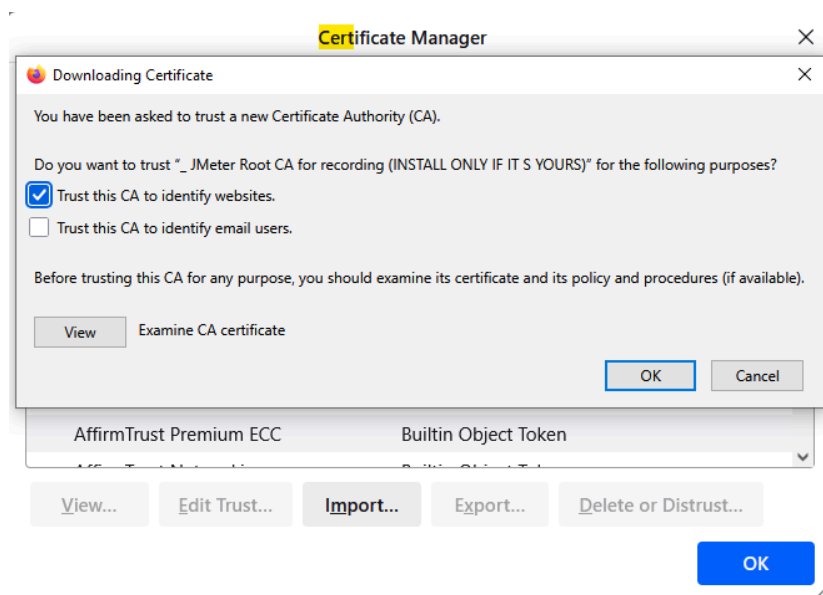thread group => add => logic controller => recording controller

Then setup proxy and add SSL certificate =>go firefox settings => search proxy => manual => certificate => manage certificate => manage imported certificate

How to Install JMeter's CA Certificate

Right click → Open / Install

1. Choose:

   - ○ Local Machine
   - ○ Trusted Root Certification Authorities

Use Kyun Karte Hain?

Agar tumhe manually har request likhne ka time nahi hai, to:

- Tum browser me normal browsing karo
- JMeter tumhare actions record karega
- Fir tum un requests ko test ke liye use kar sakti ho (load test, performance check, etc.)

Port Number Kya Hota Hai?

Port number ek number hota hai (0 se 65535 tak)
Jo computer ya server ke andar different services ya programs ko identify karne ke liye use hota hai.

JMeter Me Port Number Kyun Zaroori Hai?

Jab tum Test Script Recorder use karti ho,
to tumhara browser JMeter ko ek proxy server ki tarah use karta hai.

🟢 Proxy ka matlab: Tumhara browser ka traffic pehle JMeter ke paas jaata hai
(phir JMeter usse record karta hai, aur real website tak bhejta hai)

JMeter kis port pe sun raha hai?

Iska jawab hota hai: 8888 (ya jo tumne diya ho)
Isliye tumhe apne browser me bhi yahi port set karna padta hai.

Think Time Kya Hota Hai?

Think Time ka matlab hai:

"Ek user ne pehle request bheji — phir socha, phir agla button click kiya."

Yani do actions ke beech ka **delay** ya **waiting time**.

- ◆ Example:

- User ne login kiya

- Phir **10 seconds** ruk kar "Search" button click kiya
  Woh 10 seconds = Think Time

`Recording with Think Time` **Template Kya Karta Hai?**

1. HTTP(S) Test Script Recorder ready karta hai
2. Thread Group banata hai
3. Requests record karta hai
4. Har request ke beech "Constant Timer" ya "Uniform Random Timer" add karta hai — taake think time simulate ho jaye.

Blazemeter Recorder:

How to use Blazemeter to Record JMeter Tests

○ Step 1 - Create Blazemeter Account

○ Step 2 - Get Blazemeter Extension

○ Step 3 - Login to Blazemeter

○ Step 4 - Record test

6- How to getdata from a CSV file:

add => config elements => CSV data set config

- create a CSV file and add data.
- add java request and thread group option.
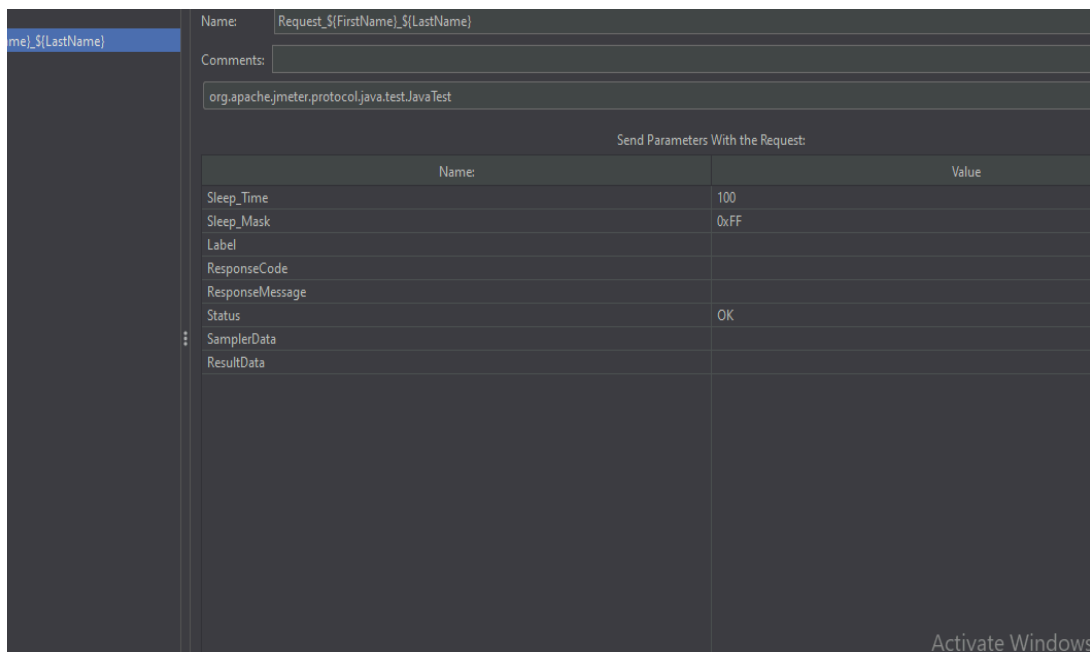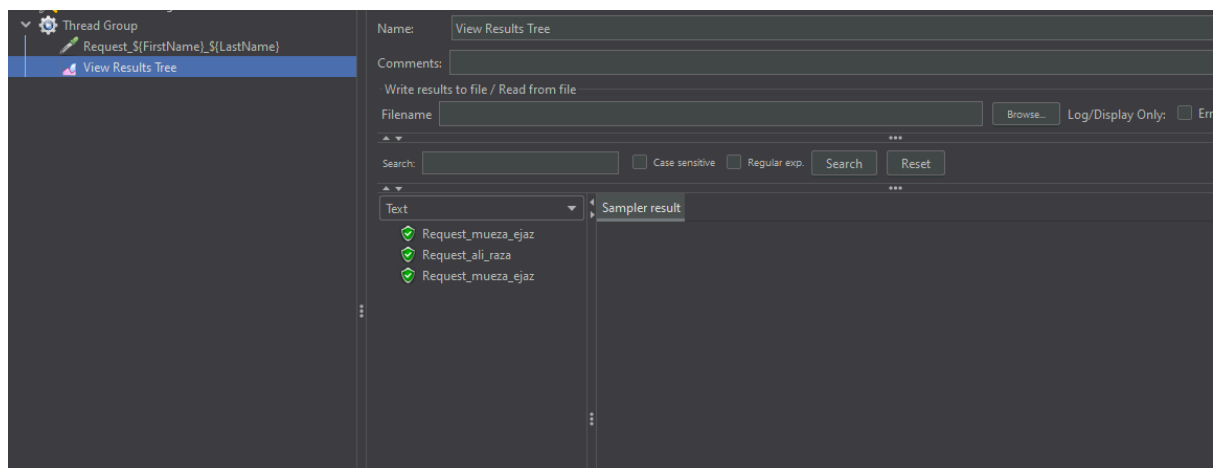- Refer values from csv file using syntax ${variableName}.

IMAGE 01

IMAGE 02:

JSR223 PostProcessor ka kaam:

JSR223 ka Full Form Kya Hai?

JSR = Java Specification Request
223 = Specification Number

- Yeh processor automatically request ke baad trigger hota hai
- Yeh above data ko read karke, aapke computer me CSV file banata hai
- Isiliye aapko manually kuch nahi lena hota — JMeter sab provide karta hai

🧪 In Short:

🟢 Aap bas JSR223 PostProcessor me code paste kar do.

JMeter apne aap se `request`, `response code`, aur `response data` le aayega.

7- Config Elements - HTTPS:

Config Elements in JMeter;

Config Elements (Configuration Elements) aise components hote hain jo aapke test execution ke liye necessary data provide karte hain — jaise:

- Default values
- Server URLs
- Parameters
- Headers
- CSV data
- Cache settings
- Cookie management

Ye elements samplers (requests) ko values provide karte hain.

- Blazemeter sy testing kary to wo already config elements add kar daita hy.

DNS Cache Manager in JMeter – Kya Hota Hai?

DNS Cache Manager JMeter ka ek Config Element hai jo test execution ke dauran DNS (Domain Name System) se related behavior ko control karta hai.

DNS ka kaam hota hai:

"`www.google.com`" jaise domain name ko IP address me convert karna — jise browser ya JMeter samajh sake.

DNS ka Basic Idea:

🔤 Jab aap browser me likhti ho:

www.google.com

To computer ko pata nahi hota ye kya cheez hai — usay IP address chahiye hota hai jaise:

142.250.182.4

DNS ka kaam hota hai:

Domain name (jaise google.com) ko uske actual IP address me convert karna.

- if we using template goto template => building and advanced test plan
- add =>config Elements => counter

Counter (Config Element)

✅ Kya hota hai?

Counter ek automatic number generator hota hai jo test ke dauraan har iteration me ek unique number deta hai. Iska use dynamic test data banane ke liye hota hai.

📌 Kyu use hota hai?

Agar aapko test ke har user ke liye alag username/email ya koi unique value chahiye ho, to aap `Counter` use karti ho.

FTP Request Defaults:

FTP ka full form hai:

👉 File Transfer Protocol

Yani:

Ek standard tareeqa (protocol) jiske zariye aap files ko ek computer se dusre computer pe transfer karti hain — internet ya network ke zariye.

FTP ka use kab hota hai?

- Jab aapko **server pe file upload** karni hoti hai
- Ya **server se file download** karni hoti hai
- Hosting, website deployment, ya testing ke liye
- Automation ke zariye files bhejne ya lene ke liye

✅ Kya hota hai?

FTP Request Defaults ek config element hai jo FTP server ke saath common/default settings set karta hai — jaise:

- Server address
- Port
- Username/password
- Remote directory path

Ye waise hi kaam karta hai jaise **HTTP Request Defaults** — lekin **FTP protocol** ke liye.

Example:

Socho aap 10 alag-alag FTP files upload/download karna chahti ho.
 Instead of writing FTP server info again and again, aap "FTP Request Defaults" me ye set karti ho.

```
Server: ftp.example.com

Username: testuser

Password: abc123

Remote Directory: /uploads
```

Ab jitne bhi FTP requests honge, wo ye default values use karenge — jab tak manually override na kiya jaye.

8- CMD:

GUI consumes memory, slower integrate with any external process CI CD

Step 1 - Open Command line > Goto JMeter's bin folder

- Run the command = CMD

Windows

- jmeter -n -t "location of your test file" -l "location of results file"

n => **non - gui mode**

t => **location of text file**

l => **log the results file**

How to see CMD help and results options:

1- jmeter -h

2- jmeter.bat -? {shows all commands to use non-gui mode}

9- HTML reports from GUI and CMD:

All FREE courses -

- How to create HTML Reports from command line & GUI
- How to create html dashboard reports from command line
- How to create html dashboard reports from standalone csv result file
- Study the html dashboard reports
- How to generate from GUI

Step 1 : Create a test plan or use existing test plan

Step 2 : Open cmd line goto jmeter bin folder

Step 3 : Run commands

Create report at the end of the test

- jmeter -n -t "location of test file" -l "location of your result file" -e -o "location of reports folder"

Create report from a standalone csv file

- jmeter -g "location of your result file" -o "location of reports folder"

Example Path:

"C:\Users\Yousuf Traders\Downloads\apache-jmeter-5.6.3\apache-jmeter-5.6.3\bin\jmeter.bat" -n -t "D:\practice-agents\HTML Reports from GUI & CMD.jmx" -l "D:\practice-agents\FinalResult.csv" -e -o "D:\practice-agents\HTML_Reportsfile"

Flags Meaning:

-n = Non-GUI mode (CLI mode me test run kare)

-t = Test Plan (your `.jmx` file path)

-l = Log file (CSV file where test results will be saved)

-e = Tell JMeter to generate the HTML Report

-o = Output folder where the HTML Report will be saved

HTTP Cookie Manager – (Login ka session yaad rakhna)

What is it?

Jab aap login karte ho kisi website ya API me, to server aapko cookie deta hai.
Ye cookie har next request me bhejni zaroori hoti hai — warna server kahega: "Tum kaun ho?"

✅ Cookie Manager JMeter ko cookies yaad rakhne deta hai, taake login session active rahe.

Example:

Aap ne ek website pe login kiya fir aap dusre pages pe ja rahe ho bina dubara login kare wo cookie aapki pehchan ban gayi.

- JMeter me agar aap login API test kar rahe hain aur cookie pass nahi ki, to next request fail ho sakti hai.

HTTP Cache Manager – (Browser ka memory simulate karna)

What is it?

Jab browser kisi image ya page ko load karta hai, to usay memory me rakh leta hai (cache)
Next time agar wohi image chahiye to fir se server se nahi mangaata — apni cache se hi dikhata hai

✅ HTTP Cache Manager same kaam karta hai JMeter me — browser ka behavior copy karta hai

Example:

YouTube khola ek video play ki dubara open ki to woh jaldi load hui kyun? kyon ki video thumbnail cache me tha.

10- Plugins manager:

1. JMeter Plugins – (Extra Tools add karna)

What is a Plugin?

JMeter ke andar already bohot saare tools hote hain.
 Lekin agar aap aur naye tools, listeners, graphs, ya samplers add karna chahe, to aap Plugins install karte hain.

 Example:

Jaise mobile me aap WhatsApp to use karte hain,
 lekin aap extra features ke liye "Sticker App" ya "Themes App" install karte ho
 wo hi plugin hota hai!

How to extend JMeter | JMeter Plugins Manager

Easy & Quick way to:

- Find plugins

- Install

- Uninstall

- Upgrade

Plugins - https://jmeter-plugins.org/wiki/Start/

Step 1 : Download plugins manager jar from https://jmeter-plugins.org/wiki/Plugi...

Step 2 : Add the jar file in jmeter lib/ext folder and restart JMeter

Step 3 : Check JMeter plugins manager is added

11- Functions and variables:

Variables in JMeter – (Jaise box jisme data store hota hai)

Kya hota hai?

> Variable ek naam hai jo kisi value ko temporarily store karta hai, taake usay test plan me baad me bhi use kiya ja sake.

Example:

Aapne CSV Data Set Config me ye data diya:

Username = mueza01

Password = 123456

Aap ne `username` aur `password` ko variable banaya. Aap HTTP Request ke body me use kar sakti hain:

{

  "email": "${username}",

  "password": "${password}"

}

`${username}` and `${password}` = JMeter variables
Wo values runtime pe CSV file se uth jaati hain.

Example:

Jaise aap ke paas Excel sheet hai jisme naam aur password diye hain —
har row ka data alag hota hai — JMeter inko variable ke through use karta hai.

Functions in JMeter – (Jaise chhoti machines jo kaam karti hain):

Function ek built-in command hoti hai jo koi action perform karta hai
(jese random numbers generate karna, date/time nikalna, encoding karna etc.)

${__functionName(parameter1, parameter2, ..., variableToStore)}

Example:

Agar aap kisi request me unique email chahte hain:

```
{

  "email": "mueza${__Random(1000,9999,)}@example.com"

}
```

 Har request me alag email banega, jaise:

mueza1743@example.com, mueza2941@example.com etc.