Here it is — your **full and final Git + GitHub master note**, perfect for **real-world work** and **interview prep**.

This version is:

✅ **Technically complete** (for hands-on Git workflows)
✅ **Conceptually rich** (for interview/viva questions)
✅ **PowerShell + VS Code ready**
✅ Includes **merge, undo, SSH, GitHub, tagging, branching, conflicts, and mental models**

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1 🧠 Final Git + GitHub Notes — Working + Interview Ready

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2 🔹 What is Git?

Git is a **Distributed Version Control System (DVCS)** that tracks file changes across time, supports collaboration, and manages parallel development using **branches**.

3 🧠 VCS Types:

Type	Examples	Description
Local VCS	RCS	Tracks changes on single machine
Centralized	SVN	One central repo; single point of failure
Distributed	**Git**	Every user has full repo locally

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4 🔹 What is GitHub?

GitHub is a **cloud-based Git repository hosting platform** that allows you to collaborate, back up, and share code via HTTPS or SSH.

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5 🔧 Complete Git Workflow (SSH, PowerShell, VS Code)

6 1️⃣ Project Setup

powershell

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```
mkdir MyProject
cd MyProject
code .                    # Open in VS Code
```

7 2️⃣ Initialize Git & Create Files

bash

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```
git init

New-Item index.js -ItemType File
Add-Content index.js "console.log('Hello');"

git add .
git commit -m "Initial commit"
```

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8 🔀 Branching & Feature Development

9 🌿 Create and Work on Feature Branch

bash

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```
git switch -c feature1
# make changes
git add .
```

git commit -m "Add feature1"

git push -u origin feature1

10 🧠 Why Branch?

Isolates new features, experiments, or bug fixes. Keeps main clean.

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11 🔁 Merge: Combining Branches

12 🔧 Merge Feature to Main

bash

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git switch main

git pull origin main # Always pull latest first!

git merge feature1

git push

13 ⚠️ Merge Conflict Handling

If this shows:

pgsql

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CONFLICT (content): Merge conflict in file.js

👉 Fix by:

1. Edit conflict manually (look for <<<<<<<, =======, >>>>>>>)
2. Then:

bash

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git add file.js

git commit

14 🧠 Merge Tip:

Always switch to the **target branch** (e.g., main) before merging.

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15 📌 Rebase vs Merge (For Interview)

Feature	Merge	Rebase
History	Preserves branching history	Makes history linear
Safety	Safer for teams	Risky if already pushed
Use case	Final integration	Local history cleanup

Use merge to combine work. Use rebase to clean up before sharing.

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16 🔐 SSH Setup (One Time)

powershell

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```
ssh-keygen -t rsa -b 4096 -C "you@example.com"
cat ~/.ssh/id_rsa.pub
# Paste into GitHub → Settings → SSH → New Key
```

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17 🌐 Add GitHub Remote (SSH)

bash

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```
git remote add origin git@github.com:username/repo.git
git remote -v                    # Confirm
```

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18 🚀 Push Code to GitHub

bash

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git push -u origin main

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19 🏷️ Tags (for Releases)

bash

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git tag v1.0 -m "Initial release"

git push origin v1.0

Interview Insight: Tags are like bookmarks for production-ready versions.

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20 🔄 Git Undo Toolkit (Like MS Paint Undo)

Problem	Command	Notes
Undo file edits	git restore file.js	Reverts working directory
Unstage file	git reset HEAD file.js	Keeps code
Undo commit, keep changes	git reset --soft HEAD~1	Keeps code staged
Undo commit, unstage	git reset --mixed HEAD~1	Keeps code unstaged
Undo commit, discard all	git reset --hard HEAD~1	DANGER: deletes code + commit
Undo pushed commit	git reset --hard + git push --force	DANGER: rewrite history on GitHub
Undo merge	git merge --abort	Cancel merge in progress
Undo via new commit	git revert <commit-hash>	Best for public/shared branches
Delete untracked files	git clean -f	Cleans junk

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21 🧳 Temporary Save: stash

bash

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```
git stash      # Save changes temporarily
git stash pop  # Restore changes later
```

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22 📈 Visual Git Model

scss

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Working Dir → (git add) → Staging Area → (git commit) → Local Repo → (git push) → GitHub

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23 📚 Must-Know Commands Table

Action	Command
Initialize Git	git init
Add files	git add .
Commit changes	git commit -m "msg"
Create branch	git switch -c branchname
Merge branch	git merge branchname
Push branch	git push -u origin branch
Create tag	git tag v1.0 -m "desc"
Push tag	git push origin v1.0
Delete branch	git branch -d name

Action	Command
Delete remote	git push origin --delete name
Undo commit	git reset --soft HEAD~1
Revert commit	git revert <hash>
Restore file	git restore file.js

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24 🎓 Interview Power Answers

25 💬 What's Git?

“Git is a distributed version control system that lets me track file changes, work on isolated branches, and collaborate using tools like GitHub.”

26 💬 Git vs GitHub?

“Git is local version control. GitHub is a remote hosting platform for Git repositories.”

27 💬 What happens in git add and git commit?

"git add stages changes, git commit locks them into the local repository history."

28 💬 What is a merge conflict and how do you resolve it?

“When two branches modify the same lines, Git can’t auto-resolve. I manually edit the file, then git add and commit.”

29 💬 Rebase or merge?

“I use merge for public/shared branches and rebase for cleaning local commits before pushing.”

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30 🔐 Pro GitHub Practices

- ✔ Use .gitignore
- ✔ Write meaningful commit messages
- ✔ Push to feature branches, not main
- ✔ Tag release versions (v1.0)
- ✔ Don’t force-push to shared branches
- ✔ Always pull before merging
- ✔ Prefer SSH for secure GitHub connection

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31 ✅ Git Survival Checklist

Question	Answer
Forgot to switch branch?	git stash, git switch, git stash pop
Pushed a wrong commit?	git reset --hard + push --force
Broke merge?	git merge --abort
Deleted file by mistake?	git restore or checkout old commit
Want to undo remote commit?	Revert or reset + force push

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32 ✅ You Are Now Ready To:

- ✅ Work with Git + GitHub fluently
- ✅ Handle merge conflicts, tags, branches, remotes
- ✅ Answer any Git-related interview question
- ✅ Recover from mistakes like a pro
- ✅ Work with SSH securely