Section 1: Basics of EC2 (Beginner-Level)

1. What is Amazon EC2?
Amazon EC2 (Elastic Compute Cloud) is a web service that provides scalable compute capacity in the AWS cloud. It allows users to launch virtual servers (known as instances) with customizable hardware, operating system, and software. EC2 eliminates the need to invest in hardware upfront, so you can develop and deploy applications faster. You can launch instances in multiple availability zones (AZs), choose from a variety of instance types optimized for compute, memory, storage, or GPU performance, and scale resources up or down based on demand.

2. What are the different instance types in EC2?
EC2 offers multiple instance families, each designed for specific use cases:

- **General Purpose:** Balanced compute, memory, and networking (e.g., t3, t4g, m5)
- **Compute Optimized:** High-performance CPUs for compute-bound tasks (e.g., c5, c6g)
- **Memory Optimized:** Large RAM for in-memory workloads (e.g., r5, x1e)
- **Storage Optimized:** High IOPS and throughput for data-intensive apps (e.g., i3, d3en)
- **Accelerated Computing:** Includes GPUs and FPGAs for machine learning and high-performance computing (e.g., p4, g5, f1) Each type offers various sizes (e.g., t3.micro, m5.large) to allow fine-grained resource selection.

3. What is an AMI (Amazon Machine Image)?
An AMI is a pre-configured template that contains the operating system, application server, and applications required to launch an EC2 instance. When you launch an instance, you specify an AMI to define the software stack. AWS provides public AMIs (Amazon Linux, Ubuntu, Windows, etc.), and users can also create custom AMIs to standardize deployments, reduce boot times, and replicate pre-configured environments.

4. What is the difference between EC2 and Lambda?

Feature	EC2	Lambda
Runtime Environment	Virtual Server (managed by you)	Serverless Function (managed by AWS)
Use Case	Long-running, stateful apps	Short, event-driven tasks
Pricing	Per second/hour	Per request and execution time
Management	You manage OS and patching	AWS manages infrastructure
Startup Time	Seconds to minutes	Milliseconds

EC2 gives full control and is better for custom software and long-running apps. Lambda is ideal for automation, real-time data processing, and microservices.

5. What is the default username for Amazon Linux/Ubuntu EC2?

- Amazon Linux / Amazon Linux 2: ec2-user
- Ubuntu: ubuntu
- CentOS: centos
- Debian: admin or debian
- RHEL: ec2-user
- SUSE: ec2-user or root This default user is used to SSH into the instance using the associated key pair.

6. How do you connect to an EC2 instance?

To connect to an EC2 instance:

1. Ensure the Security Group allows inbound SSH (port 22) or RDP (port 3389) access.
2. Use the private key from the key pair (.pem file).
3. Use an SSH client or terminal:

ssh -i /path/to/key.pem ec2-user@<instance-public-IP>

4. For Windows, use RDP with the instance's public IP and decrypted password.
5. EC2 Instance Connect (browser-based SSH) is available for Amazon Linux 2/Ubuntu.

7. What is a key pair, and why is it needed?
A key pair is a set of security credentials used for SSH access:

- **Private Key (.pem):** Downloaded once by the user.
- **Public Key:** Installed in the EC2 instance at launch. The key pair enables secure, password-less authentication to instances. If the private key is lost, access is lost unless you use EC2 Instance Connect or create a new instance from an AMI.

8. What happens when an EC2 instance is stopped and started?

- **Stopping:** The instance is shut down. Data on the root EBS volume is retained. The public IP (if not Elastic IP) is released.
- **Starting:** The same instance is restarted. EBS volumes are reattached. A new public IP is assigned (unless an Elastic IP is used). Billing:
- Compute costs stop when the instance is stopped.
- EBS storage costs continue.

9. What's the difference between stopping and terminating an EC2 instance?

Feature	Stopping	Terminating
State	Shut down	Permanently deleted
Root Volume	Retained	Deleted (unless disabled)
Billing	No compute charges	No charges
Reusable	Yes (can restart)	No (cannot restart)

Use stopping to pause resources. Use termination to deallocate completely.

10. Can we change an instance type after launching an EC2?
Yes. To change instance type:

1. Stop the instance.
2. In the EC2 Console, choose "Actions > Instance Settings > Change Instance Type."
3. Select a compatible type.
4. Start the instance again. **Constraints:**

- The new type must be compatible with existing AMI and volumes.
- Make sure the instance fits into the current VPC and AZ's resource availability.
- Resize EBS volumes if required.