AWS FUNDAMENTALS

Section 1: Core AWS Concepts (Theory-Based)

1. **What is AWS?**
   Amazon Web Services (AWS) is a cloud computing platform that provides a wide range of on-demand services such as computing power, storage, databases, networking, machine learning, and more.
2. **What are the main components of AWS?**
   Core services include: EC2 (compute), S3 (storage), RDS (database), VPC (networking), IAM (access management).
3. **What is an AWS Region?**
   A region is a geographical area that contains multiple isolated locations called Availability Zones.
4. **What is an Availability Zone?**
   An AZ is one or more data centers within a region, designed for fault tolerance and high availability.
5. **Difference between EC2 and Lambda?**
   EC2 provides virtual servers for general purpose computing; Lambda is serverless and event-driven for running code without provisioning servers.
6. **What is IAM in AWS?**
   Identity and Access Management (IAM) allows you to manage users, roles, and permissions securely.
7. **What is the AWS Free Tier?**
   A limited set of services available for free up to specific limits for 12 months after signing up.
8. **What is the Shared Responsibility Model?**
   *AWS is responsible for security **of** the cloud; customers are responsible for security **in** the cloud.*
9. **What is Auto Scaling?**
   Automatically adjusts the number of EC2 instances based on load.
10. **What are Security Groups?**
    Virtual firewalls that control inbound and outbound traffic to AWS resources.

Section 2: EC2 (Elastic Compute Cloud)

11. **What is EC2?**
    A web service that provides resizable compute capacity in the cloud.
12. **What are EC2 instance types?**
    Instance types define hardware capabilities (e.g., General Purpose, Compute Optimized, Memory Optimized).
13. **What is an AMI?**
    Amazon Machine Image is a pre-configured template to launch EC2 instances.
14. **Difference between On-demand, Reserved, and Spot instances?**
    On-demand: pay per hour; Reserved: one-year or three-year commitment; Spot: use spare capacity at reduced cost.

15. **What is user data in EC2?**
    Scripts that run at the first boot of an EC2 instance.
16. **How do you connect to an EC2 instance?**
    Using SSH for Linux or RDP for Windows.
17. **What is an Elastic IP?**
    A static public IP address you can associate with EC2.
18. **What is EBS?**
    Elastic Block Store is block-level storage for use with EC2.
19. **How can you resize an EC2 instance?**
    Stop the instance → Change instance type → Start the instance.
20. **What is the difference between EBS and instance store?**
    EBS is persistent; instance store is ephemeral and data is lost on stop/start.

☁️ Section 3: S3 (Simple Storage Service)

21. **What is Amazon S3?**
    Object storage for storing and retrieving any amount of data.
22. **What is an S3 bucket?**
    A container for storing objects in S3.
23. **What are S3 storage classes?**
    Standard, Intelligent-Tiering, Standard-IA, One Zone-IA, Glacier, Deep Archive.
24. **What is versioning in S3?**
    Keeps multiple versions of an object to recover from accidental deletion.
25. **How does S3 ensure data durability?**
    Designed for 11 nines (99.999999999%) durability using multiple copies across facilities.
26. **What is S3 Lifecycle Policy?**
    Automates transition and deletion of objects based on age.
27. **What is a pre-signed URL in S3?**
    Provides temporary access to private S3 objects.
28. **What is server-side encryption in S3?**
    Encrypts data at rest using SSE-S3, SSE-KMS, or SSE-C.
29. **What are S3 Access Control Lists (ACLs)?**
    Legacy permissions to control object-level access.
30. **What is S3 Transfer Acceleration?**
    Speeds up uploads to S3 using CloudFront edge locations.

🔐 Section 4: IAM (Identity and Access Management)

31. **What is IAM role vs IAM user?**
    User: long-term credentials. Role: temporary access, often used for apps or services.
32. **What is an IAM policy?**
    JSON document defining permissions.
33. **What are managed policies and inline policies?**
    Managed: reusable, created by AWS or user. Inline: embedded in a single user/role.

34. **What is MFA?**
    Multi-Factor Authentication adds an extra layer of security.
35. **How do you grant S3 access to an EC2 instance?**
    Assign an IAM role with appropriate S3 permissions.

☁️ Section 5: Networking & VPC

36. **What is a VPC?**
    Virtual Private Cloud is a logically isolated network for AWS resources.
37. **What is a subnet?**
    Subsection of a VPC to organize resources (public/private).
38. **What is an Internet Gateway?**
    Enables communication between instances in a VPC and the internet.
39. **What is a NAT Gateway?**
    Allows instances in private subnets to access the internet.
40. **What is a Route Table?**
    Defines the allowed network paths for outbound/inbound traffic.
41. **What is VPC Peering?**
    Connects two VPCs for communication.
42. **How is security handled in a VPC?**
    Using Security Groups and Network ACLs.
43. **Difference between Security Group and NACL?**
    SG is instance-level and stateful; NACL is subnet-level and stateless.
44. **What is a Bastion Host?**
    A secure EC2 instance used to SSH into private instances.
45. **What are Elastic Load Balancers (ELB)?**
    Distributes incoming traffic across multiple targets.

🗄️ Section 6: Databases and Storage

46. **What is Amazon RDS?**
    Relational Database Service supports MySQL, PostgreSQL, SQL Server, etc.
47. **What is Amazon DynamoDB?**
    Fully managed NoSQL database.
48. **What is Multi-AZ in RDS?**
    Automatic failover for high availability.
49. **What is Read Replica?**
    Used to offload read operations and improve performance.
50. **What is Amazon Aurora?**
    High-performance managed relational database compatible with MySQL/PostgreSQL.

☁️ Section 7: Practical Questions (Scenarios)

51. **How do you launch a website on AWS?**
    Use S3 (static), EC2 (dynamic), Route 53 (DNS), and ELB.
52. **How to backup an EC2 instance?**
    Create an AMI or snapshot of the attached EBS volume.
53. **How do you migrate data to AWS?**
    Use AWS Migration Hub, Snowball, or AWS DataSync.
54. **How to set up Auto Scaling with EC2?**
    Create Launch Template → Define scaling policy → Attach to ASG.
55. **How to secure an S3 bucket?**
    Block public access, enable encryption, attach bucket policy.
56. **How do you trigger a Lambda function from S3?**
    Use S3 event notifications to invoke Lambda.
57. **How to allow cross-region access to an S3 bucket?**
    Enable cross-region replication or use bucket policy.
58. **How to monitor AWS resources?**
    Use CloudWatch for metrics, alarms, and logs.
59. **How to log all API calls in AWS?**
    Enable AWS CloudTrail.
60. **How to set up a custom domain for an S3-hosted website?**
    Use Route 53 with alias record pointing to S3 website endpoint.

🛠️ Section 8: DevOps & Automation

61. **What is CloudFormation?**
    Infrastructure as Code (IaC) tool to automate resource provisioning.
62. **What is AWS CLI?**
    Command Line Interface to interact with AWS services.
63. **What is AWS CodePipeline?**
    Automates CI/CD workflows.
64. **How do you automate backups in AWS?**
    Use Lambda + CloudWatch or AWS Backup service.
65. **What is Elastic Beanstalk?**
    PaaS for deploying web apps without worrying about infrastructure.

📊 Section 9: Monitoring and Logging

66. **What is Amazon CloudWatch?**
    Monitoring service for AWS resources and apps.
67. **What is CloudTrail?**
    Tracks user activity and API usage.
68. **How to create custom CloudWatch metrics?**
    Use the PutMetricData API or AWS CLI.
69. **What are CloudWatch Alarms?**
    Set thresholds for metrics to trigger notifications/actions.

70. **How to view logs in AWS?**
    Use CloudWatch Logs.

❓ Section 10: Billing and Cost Optimization

71. **What is AWS Budgets?**
    Set custom cost and usage budgets.
72. **How can you reduce AWS costs?**
    Use Spot Instances, right-size resources, use Auto Scaling, and delete unused resources.
73. **What is the TCO calculator?**
    Total Cost of Ownership calculator compares AWS with on-premises solutions.
74. **What is Cost Explorer?**
    Visualizes usage patterns and spending.
75. **What is consolidated billing?**
    Combines usage from multiple accounts for volume discounts.

☁️ Section 11: Miscellaneous Services

76. **What is AWS Lambda?**
    Run code without managing servers.
77. **What is API Gateway?**
    Creates RESTful APIs to access backend services.
78. **What is Amazon CloudFront?**
    Content Delivery Network (CDN).
79. **What is AWS Fargate?**
    Serverless compute engine for containers.
80. **What is Amazon ECS/EKS?**
    Elastic Container Service / Elastic Kubernetes Service for managing containers.

❓ Section 12: Advanced Concepts

81. **What is eventual consistency in S3?**
    Changes to objects may take time to propagate across all copies.
82. **What is AWS Organizations?**
    Manages multiple AWS accounts centrally.
83. **What is a landing zone?**
    Pre-configured multi-account AWS environment for secure workloads.
84. **What is service-linked role?**
    IAM role linked to an AWS service to perform actions on your behalf.
85. **What is Amazon Kinesis?**
    Real-time data streaming service.

🔧 Section 13: Real-World Troubleshooting Questions

86. **EC2 instance is not reachable — what do you check?**
    Check SG rules, route table, subnet, and instance state.
87. **S3 file upload fails — what to check?**
    Bucket policy, IAM role, file size limits, region mismatch.
88. **Lambda times out — what to do?**
    Increase timeout, optimize code, check dependency size.
89. **High EC2 billing — how to identify?**
    Use Cost Explorer and check for unused/overprovisioned instances.
90. **App not scaling — what to check?**
    Auto Scaling policy, CloudWatch alarms, health checks.

🧠 Section 14: Behavioral and Conceptual

91. **Why do you want to work with AWS?**
    (Tailor with personal experience, scalability, innovation, cloud passion.)
92. **How do you stay updated with AWS services?**
    AWS documentation, re:Invent, blogs, certifications.
93. **What AWS project are you most proud of?**
    Describe architecture, problems solved, and outcomes.
94. **Have you worked with multi-region deployments?**
    Discuss benefits (fault tolerance, latency reduction).
95. **How do you ensure security in your AWS projects?**
    Use IAM, encryption, secure VPC design, audits.

96. How do you create a VPC with both public and private subnets in AWS?

Answer:
To create a VPC with both public and private subnets:

1. **Create a VPC** with a valid CIDR block (e.g., `10.0.0.0/16`).
2. **Create two subnets**:
   - Public Subnet (e.g., `10.0.1.0/24`)
   - Private Subnet (e.g., `10.0.2.0/24`)
3. **Attach an Internet Gateway** to the VPC for public internet access.
4. **Route Table Setup**:
   - Associate the public subnet with a route table that routes `0.0.0.0/0` to the Internet Gateway.
   - Associate the private subnet with a route table that **does not** include an Internet Gateway route.
5. **Create a NAT Gateway** in the public subnet to allow instances in the private subnet to access the internet for updates, etc.

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97. What is the AWS CLI and how is it used?

Answer:
The **AWS Command Line Interface (CLI)** is a tool that allows users to interact with AWS services using commands in a terminal or command prompt.

- To **install**, download the CLI from the AWS website.
- To **configure**:

  ```
  nginx
  CopyEdit
  aws configure
  ```

  You'll be prompted for Access Key ID, Secret Access Key, region, and output format.

- Example command:

  ```
  bash
  CopyEdit
  aws s3 ls
  ```

  This lists all S3 buckets under the authenticated account.

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98. What is AWS CloudTrail and how does it differ from CloudWatch?

Answer:

- **CloudTrail** records **API activity** (who did what and when). It's used for auditing and compliance.
- **CloudWatch** monitors **performance metrics, logs, and alarms** (e.g., CPU usage, memory, logs).

Difference:

- CloudTrail is about **"who did what"**
- CloudWatch is about **"how things are performing"**

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99. How do you set up an EC2 instance with a custom security group and key pair using the AWS Management Console?

Answer:

1. Go to the **EC2 Dashboard**.
2. Click **Launch Instance**.
3. Choose an **AMI** (e.g., Amazon Linux 2).
4. Select an **Instance Type** (e.g., t2.micro).
5. Create or select an **existing key pair** for SSH access.
6. Under **Network Settings**, create a **new security group** and:
    - Allow SSH (port 22) from your IP

    - Optionally allow HTTP (port 80) or HTTPS (443)
7. Launch the instance.

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100. What are AWS best practices for cost optimization?

Answer:
Key AWS cost optimization best practices include:

- **Right-size EC2 instances** using CloudWatch and Cost Explorer.
- **Use Reserved Instances or Savings Plans** for predictable workloads.
- **Use Spot Instances** for flexible or fault-tolerant workloads.
- **Auto Scaling** to avoid overprovisioning.
- **Delete unused resources**, such as unattached EBS volumes or idle load balancers.
- **Use S3 Lifecycle policies** to transition or delete old objects.
- **Use consolidated billing** for multiple accounts under an AWS Organization.