AWS Services:

1. **What is AWS, and what are its core services?**

   ANS - AWS stands for Amazon Web Services which is a widely used cloud computing service. It offers a range of services and solutions, allowing businesses and individuals to access computing power, storage, databases, analytics, ML and more, without the need to invest in and maintain physical infrastructure.

   Core AWS Services are: Compute service(EC2, AWS Lambda), Storage service(S3, EBS), Database service (Amazon RDS), networking services(VPC, Route 53), Content delivery and CDN, Security Services, Monitoring services. These are just a few services, but there are many other services AWS offers.

2. **Explain the key components of an AWS Virtual Private Cloud (VPC).**

   ANS - Amazon VPC is a networking service in AWS that allows you to create secure network environments within AWS cloud. Key components of Amazon VPC are :

   1. VPC - To launch and manage your AWS resources.
   2. Subnets - A range of IP addresses within your VPC for resource placement.
   3. Route table - Defines the routing rules for traffic within VPC.
   4. Internet Gateway (IGW) - Enables communication between VPC instances and the internet.
   5. NAT Gateway/Instances - Allows instances in private subnets to access the internet.
   6. VPC peering - connects one VPC to another VPC using private IP addresses.
   7. Security Groups - Acts as a virtual firewall at the instance level.
   8. Network Access Control List (NACL) - Acts as a subnet-level firewall controlling inbound and outbound traffic.

3. **How does Amazon S3 work, and what are its use cases?**

   ANS - Amazon Simple storage Service (S3) is a scalable, durable and highly available object storage service provided by AWS. It is designed to store and retrieve any amount of data from anywhere on the web.

   Amazon S3 is an object storage service that stores data as objects within buckets. An object is a file and any metadata that describes the file. A bucket is a container for objects.To store your data in Amazon S3, you first create a bucket and specify a bucket name and AWS Region. Then, you upload your data to that bucket as objects in Amazon S3. Each object has a *key* (or *key name*), which is the unique identifier for the object within the bucket.

   Customers of all sizes and industries can use Amazon S3 to store and protect any amount of data for a range of use cases, such **as data lakes, static website hosting, mobile applications, backup and restore, archive, enterprise applications, IoT devices, and big data analytics.**

4. **What is AWS Lambda, and how is it used in serverless computing?**

   ANS - AWS Lambda is a compute service that lets you run code without provisioning or managing servers.
   Lambda runs your code on a high-availability compute infrastructure and performs all of the administration of the compute resources, including server and operating system maintenance, capacity provisioning and automatic scaling, and logging. With Lambda, all you need to do is supply your code in one of the language runtimes that Lambda supports.

5. **Describe the differences between AWS EC2 and AWS ECS.**

   ANS - **AWS EC2** - Elastic compute cloud provides a VM that you can configure and manage as you would with a physical server.

   AWS ECS - (Elastic container service) / container orchestration service that allows you to deploy and manage applications as containers using Docker. You defiance the application in a container image, and ECS handles the deployment and scaling of containers across a cluster of EC2 instances.

6. **What is AWS Elastic Load Balancing (ELB), and what types of load balancers does AWS offer?**

   ANS - Elastic Load Balancing automatically distributes your incoming traffic across multiple targets, such as EC2 instances, containers, and IP addresses, in one or more Availability Zones.
   It monitors the health of its registered targets, and routes traffic only to the healthy targets. Elastic Load Balancing scales your load balancer capacity automatically in response to changes in incoming traffic.

   Types of load balancers - Application load balancer, Network load balancer and classic load balancer

7. **Explain the purpose of Amazon RDS and its benefits.**

   ANS - Amazon Relational Database Service (Amazon RDS) is a web service that makes it easier to set up, operate, and scale a relational database in the AWS Cloud.It provides cost-efficient, resizable capacity for an industry-standard relational database and manages common database administration tasks.

8. **What is AWS CloudFormation, and how is it used for infrastructure as code (IaC)?**

   ANS - It allows you to define, provision and manage your infrastructure and application resources. It enables you to define your entire infrastructure as code, which is referred to as a ‘cloudFormation template’.

9. **What are AWS Identity and Access Management (IAM) roles, and why are they important?**

   ANS - AWS Identity and Access Management (IAM) is a web service that helps you securely control access to AWS resources. With IAM, you can centrally manage permissions that control which AWS resources users can access. You use IAM to control who is authenticated (signed in) and authorized (has permissions) to use resources.

10. **How does Amazon Route 53 facilitate DNS management in AWS?**

    ANS - Amazon Route 53 is a scalable and highly available Domain Name System (DNS) web service provided by Amazon Web Services (AWS).

Linux Fundamentals:

1. **Describe the Linux kernel and its role in the operating system.**

ANS - The Linux kernel is the core of the Linux operating system. It provides a bridge between software applications and the hardware of a computer.

2. Explain the differences between a process and a thread in Linux.

ANS - A process has its own memory. A thread shares the memory with the parent process and other threads within the process.

3. What is the purpose of the /etc/passwd file in Linux?

ANS - The `/etc/passwd` file stores user account information important for the login process in Unix-like operating systems.

4. How do you set file permissions in Linux using chmod?

ANS - `chmod +rwx file_name`

5. What is the significance of the /etc/hostname file in Linux?

ANS - `/etc/hosts` is a file used by the operating system to translate hostnames to IP-addresses. It is also called the 'hosts' file.

6. How can you find the IP address of a Linux machine using command-line tools?

ANS - ifconfig OR ip addr commands

7. Describe the purpose of the cron service in Linux.

ANS - The cron service in Linux is a time-based job scheduler that allows you to automate the execution of tasks or scripts at specified intervals, called cron jobs. These jobs can run periodically, such as daily, weekly, or monthly, or at specific times throughout the day.

Cron Syntax: The cron syntax consists of five fields that define the schedule for a cron job:

```
Minute (0 - 59)
Hour (0 - 23)
Day of the month (1 - 31)
Month (1 - 12)
Day of the week (0 - 7, where both 0 and 7 represent Sunday)

For example, to run a job every day at 2:30 PM, the cron syntax would
be: 30 14 * * *
```

8. What is an inode in Linux, and why is it important for file systems?

ANS - an inode is an index node. It serves as a unique identifier for a specific piece of metadata on a given filesystem.

9. How do you search for text within files in Linux using the grep command?

ANS - `grep "test to search"`

10. Explain the concept of symbolic links (symlinks) in Linux.

ANS - A symlink is a symbolic Linux/ UNIX link that points to another file or folder on your computer, or a connected file system. This is similar to a Windows shortcut.

Bash Scripting:

1. **What is a shebang (#!) line in a Bash script, and why is it used?**

   ANS - The shebang line tells the operating system which interpreter to use to parse the remainder of a file or a script.

2. **How do you declare and use variables in Bash scripts?**

```
name = "Riya" //variable declaration
```

```
echo "my name is $name"
```

3. **Explain the purpose of control structures like if statements and loops in Bash.**

   ANS - The control structures check to see if the exit status of a Linux command is 0 or some other value. In the case of the if and while structures, if the exit status is a zero value, then the command was successful and the structure continues

4. **What is command substitution in Bash, and how is it performed?**

   ANS - Command substitution in Bash allows us to execute a command and substitute it with its standard output. E.g. text = $(ls -l)

5. **How can you pass command-line arguments to a Bash script?**

   ANS - `$./script.sh argument`

6. **Describe the purpose of the case statement in Bash.**

   ANS - The CASE statement chooses from a sequence of conditions, and executes a corresponding statement.

```
case EXPRESSION in
  Pattern_Case_1)
   STATEMENTS
   ;;
 Pattern_Case_N)
   STATEMENTS
   ;;
 *)
   STATEMENTS
   ;;
esac
```

7. **What is the role of functions in Bash scripts, and how are they defined?**

   ANS - Role of a function is for better structure and reusability.

```
function_name(){
//body of function
}
```

```
function_name  // calling a function
```

8. **How can you handle errors and exceptions in Bash scripts?**

   ANS - 'set -e' to make script exit on error and use 'set -x' to print commands before they execute, aiding in debugging.

9. **What is process substitution in Bash, and when is it useful?**

   ANS - allows you to use the output of a command or process as input for another command.

   E.g. `diff <(command1) <(command2)`

AWS and Linux Networking:

1. **How can you establish secure communication between AWS resources in different VPCs?**

   ANS - Establishing secure communication between AWS resources in different Virtual Private Clouds (VPCs) can be achieved using various AWS networking and security features. use Virtual Private Network (VPN) or AWS Direct Connect to create a secure and private connection between the VPCs.

2. **What is AWS Direct Connect, and how does it enhance network connectivity?**

   ANS - AWS Direct Connect links your internal network to an AWS Direct Connect location over a standard Ethernet fiber-optic cable. One end of the cable is connected to your router, the other to an AWS Direct Connect router. With this connection, you can create *virtual interfaces* directly to public AWS services (for example, to Amazon S3) or to Amazon VPC, bypassing internet service providers in your network path.

   AWS Direct Connect makes it easy to establish a dedicated connection from an on-premises network to one or more VPCs. AWS Direct Connect can reduce network costs, increase bandwidth throughput, and provide a more consistent network experience than internet-based connections.

3. **Explain the differences between AWS Network ACLs and Security Groups.**

   ANS - (Network Access Control Lists) Network ACLs and Security Groups are used for network security and access control, **they operate at different layers of the network stack**, **have different rule evaluation mechanisms, and serve different purposes.**

   Security Groups are often used for instance-level security and Function as stateful firewalls at transport layer (4).

   while NACLs are used for subnet-level network filtering and function as stateless at network layer(3).

   The choice between them depends on your specific security requirements and the level of control you need over your AWS resources' networking.

4. **How do you troubleshoot network connectivity issues in a Linux environment?**

   ANS - Here are the steps you can follow to troubleshoot network connectivity issues in Linux:

   1. Check Physical Connections
   2. Ping Local Resources: Test connectivity to local resources first.
   3. Check Network Configuration:You can check network settings using commands like `ifconfig` or `ip addr`
   4. Check DNS Resolution: Use the nslookup or dig command to check if DNS resolution is working correctly.
   5. Check Firewall Rules: Verify that your system's firewall is not blocking outgoing or incoming network traffic. Use the `iptables` or `firewall-cmd` command to check and adjust firewall rules as needed.
   6. Review Routing Table: Use the route or ip route command to examine the routing table. Ensure that the default gateway is correctly configured and reachable.
   7. Inspect Logs: Review system logs (e.g., `/var/log/syslog` or `/var/log/messages`) for any error messages or clues about network problems.

5. **What is an Elastic IP address in AWS, and why might you use it?**

   ANS - An Elastic IP address (EIP) in Amazon Web Services (AWS) is a static, public IPv4 address that you can allocate to your AWS resources, such as Amazon EC2 instances, NAT gateways, and Network Load Balancers.

6. **Describe the purpose of the /etc/hosts file in Linux networking.**

   ANS - The `/etc/hosts` file contains the Internet Protocol (IP) host names and addresses for the local host and other hosts in the Internet network.

7. **How can you configure a static IP address on a Linux server?**

   ANS - To configure a static IP address on a Linux server, you need to make changes to the network configuration files. The exact steps can vary slightly depending on your Linux distribution.

   1. Determine your Network Interface Name using below command

```
ip link
# or
ifconfig
```

   2. Edit the Network Configuration File (For Ubuntu and Debian-based systems):

```
sudo nano /etc/network/interfaces
```

   3. Configure the Static IP Address:

```
# Ubuntu and Debian
auto <interface-name>
iface <interface-name> inet static
address <static-IP>
netmask <subnet-mask>
gateway <gateway-IP>
dns-nameservers <DNS-server1> <DNS-server2>
```

   4. Save and exit the text editor
   5. Restart networking services

```
sudo systemctl restart networking   # For Ubuntu and Debian
# OR
sudo systemctl restart network      # For CentOS 7 and earlier
```

8. Explain the role of iptables in Linux firewall configuration.

ANS - ‘iptables’ is a command-line utility for configuring and managing packet filtering rules in the Linux kernel's Netfilter framework, which provides packet filtering and network address translation (NAT) capabilities. In essence, ‘iptables’ serves as the primary firewall management tool in Linux and plays a crucial role in securing and controlling network traffic on a Linux-based system.

9. What is the purpose of the AWS VPN service, and how is it set up?

ANS - The AWS VPN service, specifically Amazon Virtual Private Cloud (Amazon VPC) VPN, serves the purpose of securely connecting your on-premises network or remote networks to your Amazon Virtual Private Cloud (VPC) environments in AWS.

It establishes a private, encrypted connection over the internet, allowing you to extend your on-premises network into the AWS cloud while ensuring data privacy and security

10. How do you configure a network interface in Linux using the ifconfig command?

ANS - The ifconfig command (short for "interface configuration") used to be the traditional way to configure network interfaces. modern Linux distributions have largely replaced ifconfig with the ip command for network interface management.

Here's a basic overview of how to use ifconfig for network interface configuration:

1. Viewing Network Interfaces using below command:

```
ifconfig
```

2. Enable or Disable an interface

```
sudo ifconfig eth0 up
```

```
sudo ifconfig eth0 down
```

3. Assigning an IP address using below command:

```
sudo ifconfig eth0 <IP_Address> netmask <Subnet_Mask>
```

Advanced AWS Services:

1. **What is AWS Elastic Beanstalk, and how does it simplify application deployment?**

   ANS - AWS Elastic Beanstalk is a Platform as a Service (PaaS) offering provided by Amazon Web Services (AWS) that simplifies the deployment, scaling, and management of web applications and services. It is designed to make it easier for developers to deploy their applications without having to worry about the underlying infrastructure

   Key features: Easy application deployment, multiple language and platform support, built-in Autoscaling, Load Balancing, security, easy monitoring and logging.

2. **Describe the features and use cases of AWS Lambda Layers.**

   ANS - AWS Lambda Layers is a feature of AWS Lambda that allows you to manage and share code, libraries, and dependencies across multiple Lambda functions. Layers simplify the deployment and management of common components, making it easier to maintain and update shared code across different functions.

3. **What is AWS Elastic Container Service for Kubernetes (EKS), and how does it differ from ECS?**

   ANS - AWS Elastic Container Service for Kubernetes (EKS) and AWS Elastic Container Service (ECS) are both container orchestration services provided by Amazon Web Services (AWS), but they serve different purposes and are built around different container orchestration platforms

   AWS EKS is a managed Kubernetes service that simplifies the deployment, management, and scaling of containerized applications using Kubernetes.

   AWS ECS is a managed container orchestration service that allows you to run Docker containers at scale. ECS is tightly integrated with AWS services and is not based on Kubernetes.

4. **How can you set up auto scaling in AWS to handle fluctuating traffic?**

   ANS - Setting up auto scaling in AWS is a crucial step to ensure your applications can handle fluctuating traffic and maintain high availability without manual intervention. AWS offers several services and features to implement auto scaling.

   To set up auto scaling - Choose an Auto Scaling Service(EC2 Auto Scaling, AWS Elastic Beanstalk, AWS Auto Scaling), Create an Auto Scaling Group, Define Scaling Policies, Set Up Scaling Triggers, Configure Scaling Adjustments, Use Elastic Load Balancing,

Monitoring and Alerts, Testing and Validation, Optimize for Cost and Performance, Continuous Improvement

5. **Explain the concept of AWS Elastic File System (EFS) and its advantages.**

   ANS - AWS Elastic File System (EFS) is a scalable, fully managed file storage service provided by Amazon Web Services (AWS). EFS is designed to provide simple, scalable, and highly available file storage for cloud-based applications and workloads.

   Advantages: Easy to use, Scalability, High availability, performance, security, cost-effective

6. **What is AWS CloudWatch, and how is it used for monitoring and logging?**

   ANS - AWS CloudWatch is a monitoring and logging service provided by Amazon Web Services (AWS) that helps you gain operational insights into your AWS resources and applications.

   It allows you to collect and track metrics, collect and monitor log files, and set alarms to respond to specific events or threshold breaches.

   It provides a comprehensive set of tools for monitoring and troubleshooting your AWS infrastructure and applications.

   Key-features - Metrics, Alarms, Dashboards, Logs, Events and Event Bus, cross-Account Access

7. **Describe AWS Lambda@Edge and its role in serverless computing.**

   ANS - AWS Lambda@Edge is a serverless computing service provided by Amazon Web Services (AWS) that extends the capabilities of AWS Lambda to the edge locations of Amazon CloudFront, AWS's content delivery network (CDN). It allows you to run serverless functions in response to CloudFront events, enabling you to customize and optimize the content delivery and security of your web applications at the edge.

8. **How can you secure AWS resources using AWS Identity and Access Management (IAM) policies**

   ANS - AWS Identity and Access Management (IAM) allows you to control and secure access to AWS resources by defining policies and permissions for users, groups, and roles. IAM policies are a critical component of AWS security, and they play a central role in controlling who can do what in your AWS environment.

   Here's how you can secure AWS resources using IAM policies:

1. Create and Manage Users, Groups, and Roles, 2. Use Managed Policies, 3. Create Custom Policies, 4. Follow the Principle of Least Privilege, 5. Use Policy Conditions, 6. Enable MFA, 7. Regularly Review and Rotate Access, Implement Roles for Applications, Monitor and Audit access, etc.

9. **What is AWS Kinesis, and how can it be used for real-time data streaming?**

   ANS - Amazon Kinesis is a suite of services provided by Amazon Web Services (AWS) that enables real-time data streaming and processing.

   Kinesis is designed to help organizations ingest, process, and analyze large volumes of data in real time, making it suitable for various use cases that require timely insights from data streams. It consists of several components, each tailored for specific tasks within the data streaming pipeline.

10. **How do you optimize costs in AWS using features like AWS Trusted Advisor?**

    ANS - Optimizing costs in AWS is an essential part of managing your cloud infrastructure efficiently. AWS offers various tools and services to help you control and reduce your cloud spending.

    AWS Trusted Advisor is one such service that provides cost optimization recommendations based on best practices and analysis of your AWS environment.

Advanced Linux and Bash Scripting:

1. **Explain the differences between hard links and symbolic links in Linux.**

   ANS - The difference between a hard-link and a symbolic-link (soft-link) A symbolic or soft link is an actual link to the original file,

   whereas a hard link is a mirror copy of the original file. Each hard linked file is assigned the same Inode value as the original, therefore they reference the same physical file location. If you delete the original file, the soft link has no value, because it points to a non-existent file.

2. **How do you create a Bash script that runs as a daemon (background process)?**

```
#!/bin/bash
echo "Daemon is running..."
# Background the script
nohup /path/to/your/script.sh > /dev/null 2>&1 &
```

   You can use the & operator to run a command in the background. the 'nohup' command is used to run the script in the background, and > /dev/null 2>&1 is used to redirect standard

output and standard error to /dev/null to avoid any output. The & at the end puts the script in the background.

3. **Describe the purpose of process groups and sessions in Linux.**

   ANS - A process group is a collection of one or more processes that are grouped together under a single group ID (GID)

   A session is a higher-level concept that consists of one or more process groups. Sessions are associated with terminal sessions or terminal emulator windows.

   process groups and sessions are mechanisms that help manage and control processes within a terminal or shell environment.

4. **What is the purpose of the nohup command in Linux, and how does it work?**

   ANS - The ‘nohup’ command in Linux is used to run a command or a script in such a way that it continues to execute even after you log out from the terminal or close the shell session. The name "nohup" stands for "no hang up," indicating that the command should not be terminated when the terminal session is hung up (disconnected).

5. **How can you monitor system performance and resource utilization using Linux command-line tools?**

   ANS - Here are some commonly used Linux command-line tools for monitoring system performance: top, free, df, htop, iostat

6. **What is the role of chroot in Linux, and how can it be used for security?**

   ANS - chroot, short for "change root," is a Unix and Linux command that allows you to change the apparent root directory for a process and its children.

   Its main role is to create an isolated environment within a file system subtree, limiting a process's access to a particular directory and its descendants.

7. **Explain the concept of Linux containers and containerization technologies like Docker.**

   ANS - Linux containers and Docker provide a lightweight, efficient, and portable way to package and deploy applications and their dependencies. They have become an integral part of modern software development and deployment workflows, making it easier to build and manage complex applications in distributed environments.

8. **How can you automate backups of critical data in a Linux environment using Bash scripts?**

ANS - Bash scripts can help you create backup routines that run automatically on a schedule or in response to specific events. Here's a step-by-step guide on how to automate backups using Bash scripts:

1. Determine which data and directories you want to include in your backups.
2. Choose a Backup Destination
3. Create a Backup Script
4. Use the cron service to schedule the script to run at specified intervals.
5. Before relying on automated backups, test your script by running it manually to ensure it works as expected and creates valid backups.
6. Implement logging in your backup script to track the status of each backup run. You can use the logger command to send messages to the system logs, or write log entries to a specific log file.

9. Describe the use of the rsync command for efficient file synchronization in Linux.

ANS - It is widely used to copy and synchronize files and directories both locally and over remote connections. `rsync` is particularly useful for backup purposes, mirroring, and keeping data synchronized between different systems.

```
rsync [OPTIONS] SOURCE DESTINATION
```

10. How do you use regular expressions (regex) in Bash scripts for text pattern matching?

ANS - (regex) in Bash scripts allows you to perform powerful text pattern matching and manipulation. Regular expressions are patterns that describe sets of strings, and they can be used in various text-processing tasks, such as searching, matching, and substitution.

you can use regular expressions with tools like grep, sed, and parameter expansion.

```
grep 'pattern' file.txt
```