Introduction to Google Cloud Storage:

Google Cloud Storage (GCS) is a cloud-based storage solution provided by Google Cloud Platform (GCP). It allows users to store and retrieve data in a highly scalable, durable, and available manner.

Key Concepts:

Buckets: A bucket is a top-level container for storing data in GCS.

Buckets can be created and managed through the GCP Console,

the gsutil command-line tool, or the GCS API.

Objects: Objects are individual pieces of data stored within buckets.

Each object is identified by a unique key and consists of data (such as a file) and metadata (such as content type and storage class).

Storage Classes: Define how data is stored – it defines - Duration, accessbility of the data

STANDARD - (Best for **short-term** storage and **frequently accessed** data)

NEARLINE - (Best for **backups** and data accessed less than **once a month**)

COLDLINE - (Best for **disaster recovery** and data accessed less than **once a quarter**)

ARCHIVE - (Best for **long-term digital preservation** of data accessed less than once a year)

Access Control:

Access to GCS buckets and objects is managed through IAM policies, enabling users to control who can access resources and what actions they can take, set at either bucket or object level for precise permissions

Data Transfer:

You can move data into and out of GCS using methods like gsutil, which offers efficient features such as parallel transfers and synchronization with local directories.

Lifecycle Management:

Lifecycle management in GCS automates tasks like moving or deleting objects based on rules like age or storage class.

Versioning and Object Lifecycle:

Versioning in GCS stores multiple versions of objects in a bucket, safeguarding against accidental changes or deletions by creating new versions each time an object is altered or removed.

Monitoring and Logging:

GCS provides monitoring and logging for storage usage and access patterns. Usage logs track operations, while access logs record details of object access for auditing

To list all the buckets in a Project:

```
gsutil ls -p PROJECT_ID     |ls=list|
```

List Contents of a Bucket:

```
gsutil ls gs://BUCKET_NAME     |ls=list|
```

Create a new bucket:

```
gsutil mb -c nearline -l us-central1 gs://[BUCKET_NAME]
```

To enable versioning:

```
gsutil mb -b on -c [STORAGE_CLASS] -l [LOCATION] gs://[BUCKET_NAME] |mb=make_bucket|-b=versioning|-c=storage_class|-l=location|
```

To upload files in the bucket:

```
gsutil cp [LOCAL_FILE_PATH] gs://[BUCKET_NAME]/ |cp=copy|
```

To copy files from bucket to local:

```
gsutil cp gs://SOURCE_BUCKET_NAME/OBJECT_NAME DESTINATION     |cp=copy|
```

To upload multiple files in the bucket:

gsutil cp [LOCAL_DIRECTORY_OR_PATTERN] gs://[BUCKET_NAME]/ |cp=copy|

To move objects from one bucket to another bucket:

gsutil mv gs://[SOURCE_BUCKET_NAME]/[SOURCE_OBJECT_NAME] gs://[DESTINATION_BUCKET_NAME]/ |mv=move|

To delete objects in the bucket:

gsutil rm gs://[BUCKET_NAME]/[OBJECT_NAME] |rm=remove|

To set retention policy:

gsutil retention set <PERIOD> gs://[BUCKET_NAME]

To add lifecycle rule to the bucket:

gsutil lifecycle set LIFECYCLE_CONFIG_FILE gs://BUCKET_NAME

```
{
 "rule":
 [
  {
```

```
    "action": {"type": "Delete"},
    "condition": {"age": 365}
   }
  ]
}
```

To add sevice account to a particular bucket:

gsutil iam ch serviceAccount:example@project-id.iam.gserviceaccount.com:roles/YOUR_ROLE gs://[BUCKET_NAME]

To remove service account from a bucket:

gsutil iam ch -d serviceAccount:example@project-id.iam.gserviceaccount.com gs://[BUCKET_NAME] |ch=change|-d=detach|

To see the permissions a user have on bucket:

gsutil iam get gs://[BUCKET_NAME]

To make bucket publicly visible:

gsutil iam ch allUsers:objectViewer gs://[BUCKET_NAME]

To remove access to all users:

gsutil iam ch -d allUsers gs://[BUCKET_NAME]
|ch=change|-d=detach|

To delete a bucket:

gsutil rm -r gs://[BUCKET_NAME] |rm=remove/delete|-r=recursively delete the objects and subdirectories in the bucket|