Q.1 (a) Answer the following: (3 Marks)

(i) **Main Significance of Cloud Computing:**
Cloud computing allows on-demand access to computing resources, scalability, cost savings, and improved collaboration.

(ii) **Define Virtualization in Cloud:**
Virtualization in cloud computing is the process of creating a virtual version of computing resources such as servers, storage, and networks, enabling multiple users to share infrastructure efficiently.

(iii) **Two Challenges in Storing Enterprise-Level Data:**

1. **Security Risks:** Enterprises must protect sensitive data from cyber threats.
2. **Scalability Issues:** Managing large amounts of data efficiently requires dynamic storage solutions.

Q.1 (b) Objective Type (7 Marks)

(i) **Which of the following is not a characteristic of cloud computing?**
Answer: (c) **Limited scalability**

(ii) **Key feature of Platform as a Service (PaaS)?**
Answer: (c) **Allows access to software applications over the internet**

(iii) **True/False:** "In a private cloud, the computing infrastructure is shared among multiple companies."
Answer: False

(iv) **True/False:** "Application virtualization allows software to run without traditional installation on the client system."
Answer: True

(v) **Primary purpose of virtualization in IT infrastructure:**
Answer: "To create a virtual version of physical resources such as servers, storage, and networks to improve resource utilization and efficiency."

(vi) **IaaS Full Form:**
Answer: Infrastructure as a Service

(vii) **Two types of virtualizations in cloud computing:**

1. **Server Virtualization**
2. **Storage Virtualization**

Q.2 (a) Two Questions of 2 Marks (4 Marks)

(i) **Using Database as a Service (DBaaS) for a Scalable Database Solution:**
DBaaS provides cloud-based database management, enabling scalability, automated maintenance, and cost efficiency for growing businesses.

(ii) **Summarize the History and Evolution of Cloud Computing:**
Cloud computing evolved from mainframe computing to client-server models, then to virtualization, and finally to modern cloud services (IaaS, PaaS, SaaS). It has revolutionized IT by enabling remote access, cost savings, and flexible resource allocation.

Q.2 (b) Two Questions of 3 Marks (6 Marks)

(i) **Real-World Example of Storage Virtualization Usage:**
A company using cloud-based storage solutions (like AWS S3) allows seamless data access and scalability without physical storage limitations.

(ii) **Concept of Network Virtualization & Its Types:**
Network virtualization abstracts physical network resources, allowing multiple virtual networks on shared infrastructure.
Types:

1. **External Virtualization:** Combines multiple networks into one.
2. **Internal Virtualization:** Divides a single network into multiple virtual instances.
   Enhancement: It improves security, scalability, and network management efficiency.

Q.3 (Attempt Any Two) (10 Marks)

(i) **Key Distinctions Between a Public Cloud & a Private Cloud:**

Feature	Public Cloud	Private Cloud
Ownership	Third-party provider (AWS, Azure)	Single organization
Cost	Pay-per-use, lower upfront cost	Higher initial cost
Security	Shared security measures	Dedicated security
Scalability	High scalability	Limited by private infrastructure
Accessibility	Accessible to multiple users	Restricted to organization

(ii) **Different Cloud Service Models & Best-Suited for a Company:**

1. **IaaS (Infrastructure as a Service):** Virtualized computing resources, best for IT teams managing infrastructure.
2. **PaaS (Platform as a Service):** Application development platforms, suitable for developers.
3. **SaaS (Software as a Service):** Ready-to-use applications like Gmail, best for general businesses.
   Best for a company: Depends on needs; startups may prefer SaaS, while IT firms might use IaaS or PaaS.

(iii) **Major Components of the Multiprotocol Label Switching (MPLS) Server & Interaction with Virtual Networks:**

1. **Label Edge Router (LER):** Assigns and removes labels.
2. **Label Switching Router (LSR):** Forwards packets based on labels.
3. **Forwarding Equivalence Class (FEC):** Groups packets for efficient routing.
   Interaction with Virtual Networks: Enhances performance, security, and routing efficiency in cloud environments.

Q.4 (Answer the Following) (10 Marks)

(a) **Contrast Steps in Creating an Instance in Google Cloud Platform (GCP):**

1. **Log in to Google Cloud Console.**
2. **Select Compute Engine > VM Instances.**
3. **Click 'Create Instance.'**
4. **Choose a Machine Type & Configuration.**
5. **Set Up Boot Disk & Storage.**
6. **Define Network & Firewall Rules.**
7. **Review & Click 'Create.'**

(b) **Examine the Process to Store Files in a Cloud Server:**

1. **Upload File:** User uploads data to a cloud service (e.g., Google Drive, AWS S3).
2. **Data Encryption:** Files are encrypted for security.
3. **Replication:** Data is copied across multiple servers for redundancy.
4. **Access Control:** Permissions are set for authorized access.
5. **Retrieval:** Users can download or share stored files securely.

OR

(b) **Compare Structured & Unstructured Data Storage in Terms of Organization:**

Aspect	Structured Data Storage	Unstructured Data Storage
Organization	Highly organized into predefined schemas (tables, rows, columns)	Lacks a predefined format; data is stored in its native form (e.g., files, documents, media)
Data Model	Relational (RDBMS), uses schemas & relationships	No fixed data model; can be in text, images, videos, logs, etc.
Access & Retrieval	Easily searchable using SQL queries	Requires advanced search tools like AI, ML, or metadata tagging

Storage Method	Stored in structured databases (SQL, data warehouses)	Stored in file systems, NoSQL databases, data lakes, or object storage
Example Data	Customer records, financial transactions, inventory data	Emails, videos, social media posts, PDFs, IoT sensor data

Summary

Structured data storage is highly organized, making it easy to query and manage, while unstructured data storage is more flexible but requires additional processing to extract meaningful insights.