Custer and Utility Computing – Revision Notes

◇ Cluster Computing – Quick Revision

📌 Definition

- A **cluster** is a **parallel or distributed system** consisting of **inter-connected standalone computers** working as a **single integrated computing resource**.

📌 Key Features

- Composed of **PCs, workstations, or SMPs**.
- Includes **OS, middleware, parallel environments, high-speed interconnects, and apps**.
- Offers **better speed, reliability**, and **cost-efficiency** than high-end single systems.

📌 Characteristics

- Faster than LAN.
- Uses **low latency** communication protocols.
- **Loosely coupled** (unlike tightly-coupled SMPs).

📌 Types of Clusters (💯 MCQ Focus)

Type	Description
High Availability / Failover Cluster	Ensures system uptime through redundancy.
Load Balancing Cluster	Distributes tasks across nodes for optimal performance.
Parallel / Distributed Processing Cluster	Executes parts of an application in parallel on different nodes.

📌 Cluster Components

1. **Cluster Nodes** – Individual systems participating.
2. **Cluster Network** – High-speed interconnect.
3. **Network Characterization** – Defines how data flows in the cluster.

📌 Benefits of Cluster Computing (⭐ High-Yield MCQs)

- ☑ **High Availability** through redundancy.
- ☑ **Hardware Fault Tolerance** (e.g., RAID disks).
- ☑ **OS/App Reliability** – Run multiple OS/app instances.
- ☑ **Scalability** – Add nodes or CPU to SMP.
- ☑ **High Performance** – Ideal for cluster-enabled programs.

◇ Utility Computing – Quick Revision

📌 Definition

- A **pay-per-use computing model** where customers rent computing resources as needed, similar to utility services (e.g., electricity).
- **Cloud computing** is the **practical implementation** of utility computing.

📌 Key Concepts

- No high upfront costs.
- Based on **virtualization** – multiple virtual resources beyond a single time-sharing system.
- Suitable for **variable workloads**.

📌 Core Features of Utility Computing

- a) **Pay-for-use** pricing
- b) **Virtualization** & provisioning
- c) Solves **resource under-utilization**
- d) **Outsourcing model**
- e) Web services delivered as **on-demand utilities**
- f) **Automation** of provisioning & scaling

📌 Utility Computing Payment Models (🔥 Expected MCQ Area)

Model	Description
Flat Rate	Fixed monthly/yearly payment
Tiered	Charges based on usage levels
Subscription	Time-based access fee
Metered / Pay-as-you-go	Charges based on exact consumption
Standing Charges	Fixed cost for availability

- Pricing depends on: **scale**, **commitment**, and **payment frequency**.

📌 Risks in Utility Computing

- ⚠ **Data Backup** – Ensuring recoverability

- ⚠ **Data Security** – Risk of breaches
- ⚠ **SLA Definition** – Service quality commitment
- ⚠ **Partner Competency** – Reliability of providers
- ⚠ **Charge-back Justification** – Getting actual value

☑ **Quick Glance Facts for MCQs**

- Cluster = **Single virtual system** made of interconnected nodes.
- Cluster types = **High Availability**, **Load Balancing**, **Parallel Processing**.
- Utility Computing = **Usage-based model**; Cloud = Its implementation.
- Utility Computing pricing = **Flat, Tiered, Subscription, Metered**.
- Risks include **data**, **SLA**, **partner capability**, and **cost justification**.