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**Class Exercises**

**Module: Distributed Systems**

**Chapter 1: Overview of Distributed Systems**

**Question 1:** *What is the role of middleware in a distributed system?*

In a distributed system, the role of middleware is to strengthen distribution transparency and to facilitate communication among components in either the same system or a network environment.

**Question 2:**  *Explain what is meant by (Distribution) transparency, and give examples of the different types of transparency?*

The meaning of distribution transparency is the distribution aspects of a system are hidden from its users and application

Types of distribution transparency:

Access transparency

Location transparency

Migration transparency

Relocation transparency

Replication transparency

Concurrence transparency

Failure transparency

Persistence transparency

**Question 3:** *Why is it sometimes so hard to hide the occurrence and recovery from failures in a distributed system?*

There is no way to distinguish whether a message transmission is paused or failed or to hide them in a distributed system.

**Question 4:** *Why it is not always a good idea to aim at implementing the highest degree of transparency possible?*

Because to implement the highest degree of transparency you have to trade off the system performance.

**Question 5:**  *What is an open distributed system and what benefits does openness provide?*

An open distributed system is a system that offers service according to standard rules that describe syntax and semantic of those service.

The benefits of openness:

Interoperability and Composability

Extensibility and Portability

**Question 6:**  *Describe precisely what is meant by a scalable system*

A scalable system is a system that scalable in:

Size

Geographical

Administrative

**Question 7*:*** *Scalability can be achieved by applying different techniques. What are these techniques?*

The techniques that can be applied to archive scalability is

Distribution

Replication

Caching

Asynchronous communication