Assignment 1 CMT 321: Management and Engineering of Database

Course Learning Outcomes (CLO)
At the end of this course the students will be able to:
• CLO 1 -To apply concepts, methods and protocol of transaction, concurrency control, recovery, and security for database. (PO1, C3) ✓ **CLO 2** - To design different types of databases based on various characteristics and components. **(PO3, C6)** ✓ **CLO 3** - To explain the issues and latest development in database. **(PO7, A3)**

Title: Investigate of a successful E-commerce Platforms: Database Challenges and Solutions-Analyze the database challenges and solutions implemented.

Preferred Platform: Amazon, Alibaba, eBay, Walmart, Shopify
Database Used for E-commerce: NoSQL, OceanBase, MySQL, Oracle

Aim:
This assignment will help students gain knowledge on theoretical framework experience in designing and managing an e-commerce database system while applying advanced database management concepts and techniques.

Objective:
1. To discuss a secure and efficient e-commerce database system framework design while understanding and applying advanced database management concepts, techniques, and protocols.
2. To understand and apply advanced concepts and techniques in database management, including transaction processing, concurrency control, recovery mechanisms, and database security.
3. Additionally, student will investigate current issues and latest developments in database applications and technologies relevant to e-commerce.

Assignment Description:
1. Students will discuss the existing framework design used for an e-commerce database system that encompasses the following key areas as below.
2. Students will explore the following key areas through a combination of theoretical study and practical application:

No.	Criteria	Score
a.	**Concepts and Components of E-Commerce Databases:** • Describe the fundamental components of an e-commerce database system, including tables for products, customers, orders, payments, and inventory. • Explain the relational data model and normalization principles applied to design the database schema.	**(10 marks)**
b.	**Transaction Processing:** • Explain the concept of database transactions and their properties (ACID: Atomicity, Consistency, Isolation, Durability).	**(15 marks)**

	• Explain the importance of transactions in e-commerce systems, ensuring properties such as Atomicity, Consistency, Isolation, and Durability (ACID) • Design a transaction management system that handles multiple operations such as order placement, payment processing, and inventory updates.	
c.	**Concurrency Control:** • Discuss the necessity of concurrency control in an e-commerce environment to handle multiple simultaneous users. • Discuss various concurrency control mechanisms such as locking, timestamp ordering, and optimistic concurrency control. • Design a simple database application that demonstrates one or more concurrency control techniques.	**(15 marks)**
d.	**Recovery Mechanisms:** • Describe the importance of database recovery to maintain data integrity in case of failures. • Describe the different recovery techniques such as logging, log-based recovery, checkpointing and rollbacks.	**(10 marks)**
e.	**Database Security:** • Identify potential security threats in an e-commerce database, including SQL injection, unauthorized access, and data breaches. • Identify common security threats to databases and discuss methods to protect against these threats. • Discuss the security measures such as user authentication, access control, role-based access control, encryption of sensitive data, and secure communication protocols in a database application.	**(10 marks)**
f.	**Characteristics and Components:** • Explain key characteristics such as scalability, reliability, and performance optimization in the context of an e-commerce database. • Discuss storage structures and indexing methods to improve query performance.	**(20 marks)**
g.	**Current Issues and Latest Developments:** • Research and present recent trends and advancements in database technologies relevant to e-commerce, such as NoSQL databases, distributed databases, cloud-based solutions and big data technologies. • Discuss on real-world database applications and the challenges they face and solution implemented. • Discuss the current issues and the latest developments in e-commerce database technologies.	**(20 marks)**
	TOTAL	**100 MARKS (15%)**

Expected Deliverables:

- A comprehensive report detailing each aspect of the assignment, including conceptual explanations, design decisions, and implementation details.
- A frameworks design with database system demonstrating transaction processing, concurrency control, recovery mechanisms, and security measures.
- A presentation summarizing the research on current issues and the latest developments in e-commerce database technologies.

Evaluation Criteria:

- Depth of understanding and clarity of explanations for each topic.
- Quality and correctness of the designed and implemented e-commerce database system.
- Thoroughness of research on current issues and developments in database technologies.
- Quality of the final report and presentation, including organization, completeness, and clarity.

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Guideline Submission of Assignment 1

1- Report write up MSWord and Submission as pdf (No of Pages: 15-20)

2- Power point presentation and Submission as pdf (No of Slides: 10-15)

3- Make submission to 1 file ONLY: Combined the **No 1 and No2 to a single pdf**

4- Font Size: Arial 12, Single Space

5- Reference: APA Style