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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SET – A**

**SCHOOL OF ENGINEERING  
END TERM EXAMINATION – MAY/JUNE 2024**

**Semester :** Semester II - 2023

**Course Code :** CSA4006

**Course Name :** Advanced Database Technology

**Program :** MCA

**Date :** June 10, 2024

**Time :** 09.30am to 12.30pm

**Max Marks :**100

**Weightage :** 50%

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- Note:** 1. Answer ALL 5 FULL Questions.  
2. Each Full Question carries 20 Marks  
3. Scientific and non-programmable calculator are permitted.  
4. Do not write any information on the question paper other than Roll Number.
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- 1.a. State how time-based control is useful for the particular scenario and discuss it with an example. **[Knowledge]** (C01) (04 Marks)
- 1.b. Identify the characteristics of Relational databases utilize parallel processing to improve performance and scalability?**[Comprehension]** (C01) (06 Marks)
- 1.c. Determine if the following two schedules are view serializable or not: (C01) (10 Marks)  
**Schedule 1:** T1: Read(A), Write(A), Read(B), Write(B) T2: Read(C), Write(C), Read(D), Write(D)  
**Schedule 2:** T1: Read(A), Read(B), Write(A), Write(B) T2: Read(C), Read(D), Write(C), Write(D)  
Check all three conditions for view serializability and explain each with respect to the given schedules. **[Application]**
- or**
- 2.a. Define RDBMS and its features. **[Knowledge]** (C01) (04 Marks)
- 2.b. Explain why ACID properties are important in RDBMS. **[Comprehension]** (C01) (06 Marks)
- 2.c. Apply the following transactions and draw the precedence graph: (C01) (10 Marks)  
T1: Read(X), Write(Y), Read(Z)  
T2: Write(X), Read(Y), Write(Z), Read(W)  
T3: Read(Z), Write(Y), Read(X), Write(W)  
Identify any cycles present in the graph and discuss how precedence graphs aid in concurrency control and transaction management **[Application]**

- 3.a. Define and compare Document based and Key value pair. **[Knowledge]** (C02) (04 Marks)
- 3.b. Explain MongoDB and how does it differ from normal relational databases? **[Comprehension]** (C02) (06 Marks)
- 3.c. Predict the future of NoSQL based on the four classification types of that. Write in detail. **[Application]** (C02) (10 Marks)

**or**

- 4.a. List and explain the steps for Installation of MongoDB. **[Knowledge]** (C02) (04 Marks)
- 4.b. Explain CAP theorem. **[Comprehension]** (C02) (06 Marks)
- 4.c. Execute the role and significance of the \$group stage in MongoDB aggregation pipelines. Provide a detailed explanation of how the \$group stage works, including its syntax, usage, and examples of scenarios where it is commonly applied. **[Application]** (C02) (10 Marks)

- 5.a. List the types of Distributed Database. **[Knowledge]** (C03) (04 Marks)
- 5.b. Describe heterogeneous distributed database. **[Comprehension]** (C03) (06 Marks)
- 5.c. Apply replication methods and explain the functionalities of the Replication. **[Application]** (C03) (10 Marks)

**or**

- 6.a. List the characteristics of distributed database. **[Knowledge]** (C03) (04 Marks)
- 6.b. Describe the characteristics of Distributed database. **[Comprehension]** (C03) (06 Marks)
- 6.c. Implement the vertical fragmentation for the Distributed database. Choose an example Relation and explain it. **[Application]** (C03) (10 Marks)

- 7.a. Discuss the trade-offs between data consistency and availability in distributed databases. **[Knowledge]** (C03) (04 Marks)
- 7.b. Discuss the challenges of query optimization in distributed environments and the techniques used to improve query performance. **[Comprehension]** (C03) (06 Marks)
- 7.c. Consider a distributed database system consisting of three nodes: Node A, Node B, and Node C. Each node stores a full replica of the entire database. When a new record is inserted into Node A, it is immediately replicated to both Node B and Node C. Similarly, any updates or deletions made on one node are propagated to the other nodes to ensure data consistency across the entire system. Explain the concept of replication based on this example. **[Application]** (C03) (10 Marks)

**or**

- 8.a Discuss the advantages and challenges of designing and implementing loosely coupled architectures in distributed database systems. **(C03) (04 Marks)**  
**[Knowledge]**
- 8.b Discuss examples of homogeneous distributed database architectures and discuss their advantages and challenges. **(C03) (06 Marks)**  
**[Comprehension]**
- 8.c Consider a distributed database system for a multinational retail chain. The database stores information about customer orders, including order details such as order ID, customer ID, product ID, quantity, and price. Explain Vertical Fragmentation based on this example. **(C03) (10 Marks)**  
**[Application]**

- 9.a List the advantages of parallel database. **(C04) (04 Marks)**  
**[Knowledge]**
- 9.b Explain the differences between Parallel and Distributed Databases. **(C04) (06 Marks)**  
**[Comprehension]**
- 9.c Implement the concept of a shared memory architecture in distributed databases. Explain how shared memory architectures facilitate data sharing and communication among distributed nodes in a database system. **(C04) (10 Marks)**  
**[Application]**

**or**

- 10.a Define shared nothing architecture with example. **(C04) (04 Marks)**  
**[Knowledge]**
- 10.b Explain the advantages and disadvantages of the tightly coupled system. **(C04) (06 Marks)**  
**[Comprehension]**
- 10.c Operate how shared-nothing architectures enable horizontal scalability, fault tolerance, and high availability in distributed database systems. **(C04) (10 Marks)**  
**[Application]**