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**BTECH**  
**(SEM VII) THEORY EXAMINATION 2023-24**  
**DISTRIBUTED COMPUTING SYSTEM**

**TIME: 3 HRS****M.MARKS: 100****Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.**

Q no.	Question	Marks
a.	Discuss the challenges involved in detecting the termination of distributed computations.	2
b.	Explore various techniques used for achieving message ordering in distributed systems.	2
c.	Explain the differences between resource and communication deadlocks in a distributed system.	2
d.	Discuss the significance of ensuring mutual exclusion in distributed systems.	2
e.	Elaborate on the challenges posed by Byzantine faults in distributed systems.	2
f.	Provide a detailed classification of agreement problems.	2
g.	Analyze the strategies involved in recovery within distributed database systems.	2
h.	What role do checkpoints play in the recovery process?	2
i.	Define the system model for group communication in distributed databases.	2
j.	Discuss the challenges associated with maintaining consistency in a replicated environment.	2

**SECTION B****2. Attempt any three of the following:**

a.	Explain Lamport's logical clocks and vector clocks, highlighting their use in addressing the challenges of clock synchronization in distributed systems. Provide practical examples to illustrate their applications.	10
b.	Discuss the role of edge-chasing algorithms in distributed deadlock detection. How do these algorithms contribute to identifying and resolving deadlocks in a distributed environment?	10
c.	Discuss the consensus problem in the context of distributed systems. What are the key requirements for achieving consensus, and how do consensus algorithms address failures and uncertainties in a distributed environment?	10
d.	Evaluate the challenges associated with achieving fault tolerance in real-world distributed systems. How can these challenges be addressed to enhance overall system reliability?	10
e.	Explore the concept of distributed deadlocks in a distributed database system. How do they differ from traditional deadlocks, and what strategies can be employed to detect and resolve distributed deadlocks?	10

**SECTION C****3. Attempt any one part of the following:**

a.	Provide specific examples of distributed systems in real-world applications, detailing how they enhance performance and reliability. Discuss challenges faced by these systems.	10
b.	Compare and contrast different architectural models used in distributed systems. Discuss scenarios where each model is most suitable.	10

**4. Attempt any one part of the following:**

a.	Describe the key performance metrics used to evaluate distributed mutual exclusion algorithms. Discuss why these metrics are important in assessing the efficiency and effectiveness of such algorithms.	10
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b.	Compare and contrast centralized deadlock detection with distributed deadlock detection. Highlight the advantages and challenges associated with each approach.	10
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**5. Attempt any one part of the following:**

a.	Describe the major approaches and algorithms used to solve the Byzantine agreement problem. What are the key characteristics of effective solutions in the presence of Byzantine faults?	10
b.	Explain the significance of atomic commit in distributed database systems. How does it ensure consistency and reliability, and what challenges does it address in a distributed environment?	10

**6. Attempt any one part of the following:**

a.	Provide an in-depth explanation of commit protocols in the context of fault tolerance. Compare and contrast different commit protocols, highlighting their strengths, weaknesses, and use cases in distributed systems.	10
b.	Discuss the concept of voting protocols in fault-tolerant systems. How do voting protocols contribute to decision-making in the presence of failures? Provide examples of scenarios where voting protocols are particularly useful.	10

**7. Attempt any one part of the following:**

a.	Conduct a comprehensive comparison of different methods for concurrency control. Highlight scenarios where each method is most suitable, and the trade-offs involved in choosing one over the others.	10
b.	Define and differentiate between flat and nested distributed transactions. Discuss the challenges and advantages of implementing nested transactions in a distributed database environment.	10