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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA (Integrated)

SEM: VI - THEORY EXAMINATION (2025 - 2026)

Subject: Distributed System

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

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1. Attempt all parts:-

- | | | |
|-------|--|---|
| (1.1) | Components of distributed systems are located in this manner. (CO1,K2) | 1 |
| | (a) Geographically separated | |
| | (b) Single location | |
| | (c) Local only | |
| | (d) Offline | |
| (1.2) | This is a key goal of distributed systems. (CO1,K2) | 1 |
| | (a) Resource sharing | |
| | (b) Single execution | |
| | (c) Isolation | |
| | (d) Manual work | |
| (1.3) | Trusted third party used by the Kerberos protocol. (CO2, K1) | 1 |
| | (a) Key Distribution Center (KDC) | |
| | (b) ISP | |
| | (c) Certificate Authority | |
| | (d) Web Server | |
| (1.4) | Primary model concerned in Unit 2. (CO2, K2) | 1 |
| | (a) Centralized Model | |
| | (b) Object-based Distributed Model | |
| | (c) Standalone Model | |
| | (d) Batch Processing Model | |
| (1.5) | Primary benefit of Directory Services. (CO3, K2) | 1 |

- (a) Faster video playback
 - (b) Easy resource discovery
 - (c) Lower CPU temperature
 - (d) Improved mouse sensitivity
- (1.6) Property of logical clocks regarding the "Happens-Before" relation. (CO3, K2) 1
- (a) Physical distance
 - (b) Causal ordering
 - (c) Alphabetical sorting
 - (d) Numeric parity
- (1.7) Relationship between replication and transaction protocols. (CO4, K2) 1
- (a) Replication complicates atomic commit
 - (b) Replication removes the need for locks
 - (c) Replication speeds up the CPU
 - (d) Replication is only for local storage
- (1.8) Primary task of a transaction manager. (CO4, K1) 1
- (a) Designing the database schema
 - (b) Ensuring ACID properties are maintained
 - (c) Writing SQL queries
 - (d) Installing hardware
- (1.9) Primary metric for assessing "Leader Election" in a ring. (CO5, K3) 1
- (a) Monitor resolution
 - (b) Number of messages exchanged
 - (c) Weight of the server
 - (d) Keyboard layout
- (1.10) Purpose of "Fairness" in asynchronous shared memory. (CO5, K3) 1
- (a) Increasing profits
 - (b) Preventing process starvation
 - (c) Designing graphics
 - (d) Cooling the CPU

2. Attempt all parts:-

- (2.1) Explain the disadvantages of distributed systems. (CO1, K2) 2
- (2.2) State the purpose of 'Access Control' within a distributed operating system. (CO2, K2) 2
- (2.3) List the main challenges of name resolution in large-scale systems. (CO3, K2) 2
- (2.4) State the requirements for achieving serializability in distributed concurrency control. (CO4, K2) 2
- (2.5) Define the lockout-free condition in distributed mutual exclusion. (CO5, K2) 2

SECTION-B

30

Answer any one of the following:-

- (3.1) Distributed systems face several challenges. Examine issues related to security and 6

	consistency. (CO1, K4)	
(3.2)	Remote access allows users to interact with distant resources. Analyze its benefits and risks. (CO1, K4)	6
Answer any one of the following:-		
(3.3)	Describe the Request-Reply protocol for remote invocation in detail. (CO2, K3)	6
(3.4)	Compare various Access Control models used in distributed systems. (CO2, K4)	6
Answer any one of the following:-		
(3.5)	Discuss the necessity of name resolution transparency in distributed OS. (CO3, K2)	6
(3.6)	Analyze the process of service discovery in dynamic mobile environments. (CO3, K5)	6
Answer any one of the following:-		
(3.7)	Evaluate the performance of different deadlock resolution strategies in a distributed OS. (CO4, K4)	6
(3.8)	Analyze the limitations of Two-Phase Locking in a distributed environment. (CO4, K4)	6
Answer any one of the following:-		
(3.9)	Discuss the challenges of symmetry in distributed leader election. (CO5, K2)	6
(3.10)	Analyze the coordination of tasks using a Maximal Independent Set. (CO5, K3)	6
SECTION-C		50
4. Answer any <u>one</u> of the following:-		
(4.1)	Evaluate fault tolerance techniques used in distributed systems with examples. (CO1, K5)	10
(4.2)	Examine the concept of consistency in distributed systems and related challenges. (CO1, K4)	10
5. Answer any <u>one</u> of the following:-		
(5.1)	Provide an elaborate discussion on the communication and invocation mechanisms found in Unit 2. (CO2, K3)	10
(5.2)	Analyze the roles of the 'Dispatcher' and 'Skeleton' in server-side remote execution. (CO2, K4)	10
6. Answer any <u>one</u> of the following:-		
(6.1)	Describe the relationship between distributed debugging and event-based programming. (CO3, K4)	10
(6.2)	Discuss the design of a resilient discovery service for ad-hoc distributed systems. (CO3, K3)	10
7. Answer any <u>one</u> of the following:-		
(7.1)	Discuss the relationship between replication strategies and transaction commit latency. (CO4, K4)	10
(7.2)	Provide an in-depth description of the interaction between concurrency control and replication. (CO4, K4)	10
8. Answer any <u>one</u> of the following:-		
(8.1)	Illustrate the logical flow of a lockout-free mutual exclusion algorithm. (CO5, K3)	10

(8.2) Discuss the relationship between shared memory registers and process synchronization. (CO5, K3)

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