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Periyanaickenpalayam, Coimbatore – 641020

BACHELOR OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

QUESTION BANK

III YEAR

ODD SEMESTER

ACADEMIC YEAR 2024 – 2025

INDEX

HEAD OF THE DEPARTMENT

ACOE **PRINCIPAL** **CHAIRMAN**

CS3551

DISTRIBUTED COMPUTING

UNIT I

INTRODUCTION

Introduction: Definition-RelationtoComputerSystemComponents–Motivation–Message-Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What are the main components of a computer system related to distributed systems?	1	1	2
2.	Differentiate between message-passing systems and shared memory systems.	1	2	2
3.	List any two advantages of a distributed system	1	1	2
4.	What are the primitives used for distributed communication?	1	1	2
5.	Differentiate between synchronous and asynchronous execution.	1	2	2
6.	What is the significance of the global state in a distributed system?	1	2	2
7.	State any two challenges in designing a distributed system.	1	1	2
8.	What are the models of communication networks in a distributed system?	1	1	2
	PART B			
1.	Discuss the motivation for using distributed systems. What are the advantages and challenges?	1	5	16
2.	Describe the primitives for distributed communication and their significance in real-world applications.	1	3	16
3.	Differentiate between synchronous and asynchronous execution in distributed systems with examples	1	4	16
4.	Design a simple distributed system architecture for a cloud-based application and discuss its components.	1	6	16

UNIT II

LOGICAL TIME AND GLOBAL STATE

Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks – Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Recording Algorithms: Introduction–SystemModelandDefinitions– Snapshot Algorithms for FIFO Channels.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is clock drift in a distributed system?	1	1	2
2.	Differentiate between physical clocks and logical clocks.	1	2	2
3.	What is the happened-before (→) relation in Lamport timestamps?	1	2	2
4.	What are the types of message ordering in distributed systems?	1	2	2
5.	Differentiate between FIFO order and total order in message communication	1	2	2
6.	Define causal order in message passing	1	1	2
7.	What is a snapshot algorithm in a distributed system?	1	1	2
8.	Mention any two properties of FIFO channels in distributed systems.	1	2	2
	PART B			
1.	Describe Lamport's logical clock algorithm with an example. How does it ensure event ordering?	1	3	16
2.	Explain asynchronous execution with synchronous communication in distributed systems	1	4	16
3.	Compare and contrast different message ordering paradigms (FIFO, causal order, total order) in distributed systems	1	5	16
4.	Explain the Chandy-Lamport snapshot algorithm for recording global states in FIFO channels.	1	4	16

UNIT III

DISTRIBUTED MUTEX AND DEADLOCK

Distributed Mutual exclusion Algorithms: Introduction–Preliminaries–Lamport's algorithm –Ricart- Agrawala's Algorithm — Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm for the AND model and OR Model.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Lamport's algorithm for mutual exclusion.	1	1	2
2.	What is the key difference between Lamport's and Ricart-Agrawala's algorithm?	1	2	2
3.	State two advantages of token-based mutual exclusion algorithms	1	2	2
4.	How does Suzuki-Kasami's algorithm ensure mutual exclusion?	1	1	2
5.	Define deadlock in distributed systems.	1	1	2
6.	What is a wait-for graph (WFG) in deadlock detection?	1	1	2
7.	Differentiate between AND and OR models in deadlock detection	1	2	2
8.	What are the methods to handle deadlocks in distributed systems?	1	2	2
	PART B			
1.	Describe Ricart-Agrawala's algorithm in detail. How does it improve Lamport's algorithm?	1	4	16
2.	Compare and contrast token-based and timestamp-based mutual exclusion algorithms	1	5	16
3.	Discuss different approaches to handling deadlocks in distributed systems	1	5	16
4.	Explain the working of the Chandy-Misra-Haas algorithm for the OR model with an example.4	1	4	16

UNIT IV

CONSENSUS AND RECOVERY

Consensus and Agreement Algorithms: Problem Definition–Overview of Results–Agreement in a Failure-Free System(Synchronous and Asynchronous) –Agreement in Synchronous Systems with Failures; Check pointing and Rollback Recovery: Introduction–Background and Definitions–Issues in Failure Recovery–Checkpoint-based Recovery–Coordinated Check pointing Algorithm-Algorithm for Asynchronous Check pointing and Recovery

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is the difference between synchronous and asynchronous agreement?	1	2	2
2.	Define the role of failure detectors in achieving consensus.	1	2	2
3.	What is Byzantine agreement in distributed systems?	1	1	2
4.	What are the main challenges in reaching consensus in asynchronous systems?	1	1	2
5.	Differentiate between coordinated and uncoordinated checkpointing	1	2	2
6.	What is rollback propagation?	1	1	2
7.	What is a stable storage in the context of rollback recovery?	1	1	2
8.	Define asynchronous checkpointing	1	1	2
	PART B			
1.	Explain the consensus problem in distributed systems. Why is it difficult to achieve in asynchronous systems?	1	4	16
2.	Discuss Byzantine agreement and its solutions in a distributed system.	1	4	16
3.	Describe the challenges and techniques used in checkpoint-based rollback recovery	1	3	16
4.	Discuss the issues in failure recovery and how rollback recovery handles them.	1	5	16

UNIT V

CLOUD COMPUTING

Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services

Q.No	Question	CO	BTL	Marks
	PART A			
1.	List any two characteristics of cloud computing**.**	5	2	2
2.	What are the three main cloud service models?	5	1	2
3.	Differentiate between public and private clouds.	5	2	2
4.	List any two driving factors of cloud computing.	5	1	2
5.	Mention two challenges of cloud computing.	5	1	2
6.	What is virtualization in cloud computing?	5	2	2
7.	What is the role of load balancing in cloud computing?	5	2	2
8.	What is replication in cloud computing?	5	1	2
	PART B			
1.	Explain the cloud service models (IaaS, PaaS, SaaS) with suitable examples.	5	3	16
2.	Compare and contrast private, public, hybrid, and community cloud models.	5	5	16
3.	Explain virtualization in cloud computing and its role in resource optimization	5	3	16
4.	Evaluate different cloud computing platforms and their services (AWS, Azure, Google Cloud).	5	5	16

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CCS334 - BIG DATA ANALYTICS

UNIT I

UNDERSTANDING BIG DATA

Introduction to big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data applications– big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Big data.	1	1	2
2.	List out the key trends in big data.	1	2	2
3.	Define Web analytics.	1	1	2
4.	Define HDFS	1	1	2
5.	State the difference between inter and trans firewall analytics.	1	2	2
6.	Define Crowdsourcing	1	1	2
7.	What is the Internal Firewall?	1	1	2
8.	State the difference between Big data and cloud computing	1	2	2
	PART B			
1.	Generalize the characteristics of big data applications and explain how the big data use cases leverages the benefits and values.	1	5	16
2.	Write brief notes about Web analytics Explain in detail about the big data technologies	1	3	8 8
3.	With a neat sketch explain Apache Hadoop Ecosystem.	1	4	16
4.	Explain about mobile business intelligence with an example Explain in detail about inter and trans firewall analytics.	1	5	16

UNIT II

NOSQL DATA MANAGEMENT

Introduction to NoSQL – aggregate data models – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – master-slave replication – consistency - Cassandra – Cassandra data model – Cassandra examples – Cassandra clients.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is the primary Advantage of aggregate data models in NoSQL databases?	2	1	2
2.	How do graph databases differ from other NoSQL databases?	2	2	2
3.	What are materialized views in the context of NoSQL databases?	2	2	2
4.	State CAP Theorem.	2	2	2
5.	List the advantages of Sharding.	2	2	2
6.	Why is Cassandra known for its high availability and fault tolerance?	2	2	2
7.	What does it mean for a database to be schemaless?	2	1	2
8.	What are the primary key characteristics in a Cassandra data model?	2	1	2
	PART B			
1.	Explain in detail about all the Aggregate Data Model in NOSQL databases	2	5	16
2.	Explain in detail about Schema less databases. Explain details about materialized views in NOSQL.	2	5	8 8
3.	Elaborate the Distribution model with a neat sketch.	2	6	16
4.	Elaborate the architecture and Data model of Cassandra with a neat sketch.	2	6	16

UNIT III

MAP REDUCE APPLICATIONS

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Map Reduce.	3	1	2
2.	List out failures in classic map reduce.	3	2	2
3.	Define the term MR unit	3	1	2
4.	What is fair Scheduler?	3	1	2
5.	What are the limitations of Map Reduce.	3	1	2
6.	Define the term YARN.	3	1	2
7.	Differentiate YARN and Map Reduce.	3	2	2
8.	What is Text Input Format?	3	1	2
	PART B			
1.	Explain in detail about YARN architecture. Write about failures in classic Map-reduce.	3	2	16
2.	How are failures managed in MapReduce and YARN, and what mechanisms ensure the reliability and fault tolerance of MapReduce jobs in the face of node or task failures?	3	4	16
3.	What are the key considerations in job scheduling for MapReduce, and how do fair scheduling and capacity scheduling algorithms work to optimize resource allocation?	3	4	16
4.	Explain detail about anatomy of MapReduce job run.	3	5	16

UNIT IV

BASICS OF HADOOP

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming –Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts –Java interface – data flow – Hadoop I/O – data integrity – compression – serialization –Avro – file-based data structures - Cassandra – Hadoop integration.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define the term scaling out.	4	1	2
2.	Why do we need Hadoop streaming?	4	2	2
3.	Define the term name node and data node.	4	1	2
4.	Write down the advantages of Hadoop.	4	1	2
5.	What is data locality optimization?	4	2	2
6.	List out types of Hadoop data formats.	4	1	2
7.	Define serialization.	4	1	2
8.	What is Cassandra and its uses?	4	1	2
	PART B			
1.	What is Hadoop streaming? Explain the concept by using the diagram. Explain in detail about the Hadoop I/O system.	4	2	8 8
2.	With a neat sketch explain Hadoop distributed file system Architecture. Explain in detail about serialization in Hadoop.	4	5	8 8
3.	Explain in detail about Avro with an example. Write brief notes on Cassandra and its functions in big data.	4	3	8 8
4.	Explain in detail HDFS concepts in Hadoop and Java interface.	4	5	16

UNIT V

HADOOP RELATED TOOLS

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Write down the Hive QL queries.	5	2	2
2.	List the features of Hbase.	5	1	2
3.	What is the difference between HBase and Hive?	5	2	2
4.	List down the Hive DDL commands.	5	2	2
5.	Write down the Hive QL queries.	5	2	2
6.	What is Pig, HBase, Hive?	5	1	2
7.	Define Pig Latin.	5	1	2
8.	What is CRUD operation?	5	1	2
	PART B			
1.	Explain in detail about Hbase data model Hbase clients with an example.	5	2	16
2.	Explain in detail about Pig data model. Write a brief about Pig Latin scripts	5	4	8 8
3.	Explain in detail about HiveQL queries.	5	5	16
4.	Explain in detail about Hive data types and file formats.	5	5	16

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CCS341

DATA WAREHOUSING

UNIT I

INTRODUCTION TO DATA WAREHOUSE

Data warehouse Introduction - Data warehouse components- operational database Vs data warehouse – Data warehouse Architecture – Three-tier Data Warehouse Architecture - Autonomous Data Warehouse- Autonomous Data Warehouse Vs Snowflake - Modern Data Warehouse

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is a Data Warehouse?	1	1	2
2.	List the components of a Data Warehouse.	1	1	2
3.	What are the layers in Three-Tier Data Warehouse Architecture?	1	1	2
4.	What is the difference between an Operational Database and a Data Warehouse?	1	1	2
5.	Describe the difference between Autonomous Data Warehouse and Snowflake.	1	2	2
6.	How does the Three-Tier Data Warehouse Architecture enhance performance?	1	2	2
7.	Differentiate between Snowflake's architecture and traditional data warehouses.	1	2	2
8.	What is the difference between an Operational Database and a Data Warehouse?	1	1	2
	PART B			
1.	Analyze the key components of a data warehouse and explain how they contribute to efficient data management and decision-making.	1	4	16
2.	Analyze the significance of Three-Tier Data Warehouse Architecture and explain how it improves scalability, performance, and data security.	1	3	16
3.	Evaluate the advantages and challenges of implementing a modern cloud-based data warehouse compared to a traditional on-premises data warehouse.	1	5	16
4.	Evaluate the significance of Snowflake's architecture in modern data warehousing and justify whether it can fully replace traditional data warehouse solutions.	1	5	16

UNIT II

ETL AND OLAP TECHNOLOGY

What is ETL – ETL Vs ELT – Types of Data warehouses - Data warehouse Design and Modeling - Delivery Process - Online Analytical Processing (OLAP) - Characteristics of OLAP - Online Transaction Processing (OLTP) Vs OLAP - OLAP operations- Types of OLAP- ROLAP Vs MOLAP Vs HOLAP.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is ETL in Data Warehousing?	2	1	2
2.	List the types of Data Warehouses.	2	1	2
3.	What is Data Warehouse Design and Modeling?	2	1	2
4.	What is OLAP?	2	1	2
5.	What is the difference between OLTP and OLAP?	2	1	2
6.	Differentiate between ETL and ELT in terms of performance and data handling.	2	2	2
7.	Differentiate between MOLAP, ROLAP, and HOLAP.	2	2	2
8.	Explain the role of Delivery Process in a Data Warehouse.	2	2	2
	PART B			
1.	Analyze the ETL process in data warehousing and explain how each step (Extract, Transform, Load) impacts the efficiency and accuracy of the data warehouse.	2	4	16
2.	Analyze the different types of data warehouses and explain how they address various business needs.	2	4	16
3.	Compare ROLAP, MOLAP, and HOLAP architectures and analyze their advantages and disadvantages in OLAP systems.	2	4	16
4.	Evaluate the effectiveness of various data warehouse design and modeling approaches, including star schema, snowflake schema, and fact constellation.	2	5	16

UNIT III

META DATA, DATA MART AND PARTITION STRATEGY

Meta Data – Categories of Metadata – Role of Metadata – Metadata Repository – Challenges for Meta Management - Data Mart – Need of Data Mart- Cost Effective Data Mart- Designing Data Marts- Cost of Data Marts- Partitioning Strategy – Vertical partition – Normalization – Row Splitting– Horizontal Partition

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is Metadata in data warehousing?	3	1	2
2.	List the main categories of Metadata.	3	1	2
3.	What is a Data Mart?	3	1	2
4.	List the different partitioning strategies used in data marts.	3	1	2
5.	Define Normalization in the context of data warehouses.	3	2	2
6.	Explain the difference between Business Metadata and Technical Metadata.	3	2	2
7.	Explain how cost-effective data marts can be designed.	3	2	2
8.	What is Vertical Partitioning in data warehousing?	3	1	2
	PART B			
1.	Analyze the categories of metadata and explain how each category plays a role in enhancing the efficiency of data warehouse operations.	3	4	16
2.	Compare and analyze vertical and horizontal partitioning strategies in data warehouses and explain their impact on query performance and data management.	3	4	16
3.	Evaluate the need for cost-effective data marts and suggest strategies for designing low-cost, scalable data marts.	3	5	16
4.	Evaluate the process of designing data marts and assess how schema design (e.g., star schema vs. snowflake schema) impacts data mart performance and usability.	3	5	16

UNIT IV

DIMENSIONAL MODELING AND SCHEMA

Dimensional Modeling- Multi-Dimensional Data Modeling – Data Cube- Star Schema- Snowflake schema- Star Vs Snowflake schema- Fact constellation Schema- Schema Definition - Process Architecture- Types of Data Base Parallelism – Datawarehouse Tools

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is Dimensional Modeling?	4	1	2
2.	What is a Data Cube in data warehousing?	4	1	2
3.	What is the difference between Star Schema and Snowflake Schema?	4	1	2
4.	List the types of Database Parallelism.	4	1	2
5.	Name some common Data Warehouse Tools.	4	1	2
6.	Differentiate between Intra-query Parallelism and Inter-query Parallelism.	4	2	2
7.	Explain the purpose of OLAP tools in data warehouses.	4	2	2
8.	Why is Snowflake Schema more normalized than Star Schema?	4	2	2
	PART B			
1.	Analyze the importance of Dimensional Modeling in a data warehouse and explain how facts and dimensions improve data analysis.	4	4	16
2.	Compare and analyze Star Schema and Snowflake Schema in terms of structure, performance, and usability.	4	4	16
3.	Analyze the concept of Database Parallelism and explain how different types of parallelism enhance data warehouse performance.	4	5	16
4.	Evaluate the role of Fact Constellation Schema in modern data warehouse design and its effectiveness in handling large-scale business data.	4	5	16

UNIT V

SYSTEM & PROCESS MANAGERS

Data Warehousing System Managers: System Configuration Manager- System Scheduling Manager - System Event Manager - System Database Manager - System Backup Recovery Manager - Data Warehousing Process Managers: Load Manager – Warehouse Manager- Query Manager – Tuning – Testing

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is the role of a System Configuration Manager in a data warehousing system?	5	1	2
2.	Define System Event Manager.	5	1	2
3.	What is the function of a System Backup and Recovery Manager?	5	1	2
4.	What is the role of a Warehouse Manager in data warehousing?	5	1	2
5.	What is the function of a Query Manager?	5	1	2
6.	What is Testing in a data warehousing system?	5	1	2
7.	Differentiate between Load Manager and Warehouse Manager in a data warehouse process.	5	2	2
8.	How does a System Database Manager enhance query efficiency?	5	2	2
	PART B			
1.	Analyze the roles and responsibilities of various Data Warehousing System Managers in ensuring the efficient functioning of a data warehouse.	5	4	16
2.	Compare and analyze the roles of Query Manager, Tuning, and Testing in enhancing query performance and ensuring data warehouse reliability.	5	4	16
3.	Evaluate the importance of System Managers (Configuration, Scheduling, Event, Database, and Backup Recovery Managers) in maintaining the performance, security, and scalability of a data warehouse.	5	5	16
4.	Evaluate the role of process automation through Scheduling Manager and Event Manager in improving data warehouse operational efficiency and reducing manual intervention.	5	5	16

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CB3491

CRYPTOGRAHY AND CYBER SECURITY

UNIT I

INTRODUCTION TO SECURITY

Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services and Mechanisms – A Model for Network Security – Classical encryption techniques: Substitution techniques, Transposition techniques, Steganography – Foundations of modern cryptography: Perfect security – Information Theory – Product Cryptosystem – Cryptanalysis.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Computer Security.	1	1	2
2.	What is Cryptography?	1	1	2
3.	What is Steganography?	1	1	2
4.	List the types of Security Attacks.	1	1	2
5.	What are Security Services?	1	1	2
6.	Define Security Mechanisms.	1	1	2
7.	What is Cryptanalysis?	1	1	2
8.	Differentiate between Passive and Active Attacks.	1	2	2
	PART B			
1.	Elaborate on the various classical encryption techniques and their weaknesses.	1	5	16
2.	Discuss in detail about Security Services and Security Mechanisms with examples.	1	3	16
3.	Explain in detail the different types of Substitution and Transposition techniques.	1	5	16
4.	Explain in detail about Steganography and its applications in secure communication.	1	3	16

UNIT II

SYMMETRIC CIPHERS

Number theory – Algebraic Structures – Modular Arithmetic - Euclid‘s algorithm – Congruence and matrices – Group, Rings, Fields, Finite Fields SYMMETRIC KEY CIPHERS: SDES – Block Ciphers – DES, Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block ciphe rmode of operation – Evaluation criteria for AES – Pseudorandom Number Generators – RC4 – Keydistribution.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define modular arithmetic with an example.	2	1	2
2.	What is Euclidean Algorithm and its significance in cryptography?	2	1	2
3.	Differentiate between a Group, Ring, and Field.	2	2	2
4.	List the different block cipher modes of operation.	2	2	2
5.	What is the role of a pseudorandom number generator in cryptography?	2	2	2
6.	What is the key difference between DES and AES?	2	2	2
7.	What is the avalanche effect in block ciphers?	2	2	2
8.	Why is key distribution a challenge in symmetric key cryptography?	2	4	2
1.	Describe the structure of DES encryption and decryption process with a neat diagram. Discuss its security vulnerabilities.	2	4	16
2.	Compare and contrast different block cipher modes of operation and explain which mode is suitable for what kind of application.	2	4	16
3.	Describe the working of the RC4 stream cipher with a suitable example. Discuss its strengths and weaknesses.	2	4	16
4.	Explain different key distribution techniques used in symmetric cryptography. What are the challenges faced in ensuring secure key distribution?	2	6	16

UNIT III

ASYMMETRIC CRYPTOGRAPHY

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization -Euler's totient function, Fermat's and Euler's Theorem – Chinese Remainder Theorem – Exponentiation and logarithm ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange -– Elliptic curve arithmetic – Elliptic curve cryptography.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define prime numbers and give an example.	3	1	2
2.	What is the purpose of primality testing in cryptography?	3	1	2
3.	Define the Chinese Remainder Theorem and mention one application.	3	1	2
4.	State Euler's totient function and compute $\varphi(10)$.	3	2	2
5.	Explain Fermat's theorem in number theory.	3	2	2
6.	State the key steps involved in RSA encryption and decryption.	3	2	2
7.	Define elliptic curve cryptography (ECC) and its advantage over RSA.	3	2	2
8.	What is the main advantage of the Diffie-Hellman key exchange?	3	1	2
1.	Describe the RSA algorithm in detail, including key generation, encryption, and decryption steps, with an example.	3	3	16
2.	Explain the Diffie-Hellman key exchange algorithm and demonstrate it with an example. What are its security challenges?	3	4	16
3.	State and prove Euler's theorem with an example. How is it used in RSA encryption?	3	4	16
4.	Discuss the importance of key distribution and key management in asymmetric cryptography. How does it ensure secure communication?	3	6	16

UNIT IV

INTEGRITY AND AUTHENTICATION ALGORITHMS

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function: HMAC, CMAC – SHA – Digital signature and authentication protocols – DSS – Schnorr Digital Signature Scheme – ElGamal cryptosystem – Entity Authentication: Biometrics, Passwords, Challenge Response protocols – Authentication applications – Kerberos MUTUAL TRUST: Key management and distribution – Symmetric key distribution using symmetric and asymmetric encryption – Distribution of public keys – X.509 Certificates.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What are the primary requirements of authentication in cryptography?	4	1	2
2.	Define a Message Authentication Code (MAC).	4	1	2
3.	State the purpose of the Secure Hash Algorithm (SHA).	4	1	2
4.	What is the ElGamal cryptosystem?	4	1	2
5.	Differentiate between MAC and hash functions	4	2	2
6.	What is HMAC and how does it enhance security?	4	2	2
7.	What are the key security properties of hash functions?	4	2	2
8.	What is a digital signature and how does it ensure authenticity?	4	2	2
1.	**Explain digital signatures and describe the working of the Digital Signature Standard (DSS) with an example.**	4	3	16
2.	Illustrate the Schnorr Digital Signature Scheme with an example. How does it provide security?	4	4	16
3.	Describe the Kerberos authentication system. How does it ensure secure mutual authentication?	4	4	16
4.	Discuss the distribution of public keys and explain the role of X.509 certificates in securing communications.	4	6	16

UNIT V

CYBER CRIMES AND CYBER SECURITY

Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods –Password Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Cyber Crime.	5	1	2
2.	What is password cracking?	5	1	2
3.	Define keyloggers and their purpose.	5	1	2
4.	What is cloud security?	5	1	2
5.	How does SQL Injection affect web security?	5	2	2
6.	List two methods used in NAC to prevent unauthorized access.	5	2	2
7.	What are the key components of web security?	5	2	2
8.	List two best practices for improving wireless security.	5	2	2
1.	Analyse the impact of keyloggers and spyware on information security. Suggest preventive measures.	5	4	16
2.	Explain SQL Injection in detail with an example. How can web applications defend against it?	5	4	16
3.	Evaluate the effectiveness of Network Access Control (NAC) in preventing unauthorized access.	5	5	16
4.	Discuss different security mechanisms used in web security. Which one is the most effective and why?	5	5	16

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CS3591

COMPUTER NETWORKS

UNIT I

INTRODUCTION AND APPLICATION LAYER

Data Communication - Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – DNS – SNMP

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What are the different transmission modes in data communication?	1	1	2
2.	Define Flow Control	1	1	2
3.	What is DNS?	1	1	2
4.	Define Computer Network	1	1	2
5.	Differentiate between LAN, MAN, and WAN	1	2	2
6.	What is protocol layering?	1	1	2
7.	List the four layers of the TCP/IP model	1	1	2
8.	List the seven layers of the OSI model	1	2	2
	PART B			
1.	Explain in detail about the OSI architecture	1	5	16
2.	(i)Explain HTTP with an Example (ii)Explain SMTP in detail	1	5	16
3.	Demonstrate the working of an E-Mail in detail	1	5	16
4.	Demonstrate the working of Domain Name System with example	1	5	16

UNIT II

TRANSPORT LAYER

Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control - Congestion Control - Congestion avoidance (DECbit, RED) – SCTP – Quality of Service

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Explain about the socket address?	2	2	2
2.	What is SCTP? List the services of SCTP	2	1	2
3.	Define QOS	2	1	2
4.	What are the services provided by the transport layer protocol?	2	1	2
5.	What is the purpose of the transport layer?	2	1	2
6.	State two characteristics of UDP	2	1	2
7.	How does TCP provide reliability?	2	2	2
8.	What is the difference between TCP and UDP?	2	2	2
1.	With a neat sketch, Explain about the segment format of TCP and UDP	2	5	16
2.	With a neat Sketch, Explain in detail the events and transitions about the TCP State-Transition diagrams (STD).	2	5	16
3.	Explain in detail about congestion control techniques in transport layer	2	5	16
4.	Explain in detail i)SCTP flow control ii)SCTP error control	2	5	16

UNIT III

NETWORK LAYER

Switching : Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Explain the three Phases involved in the circuit switching	3	2	2
2.	Explain about the Packet Switching	3	2	2
3.	Difference between CSMA Collision detection and Collision Avoidance	3	1	2
4.	Define tunneling	3	1	2
5.	Differentiate between circuit switching and packet switching.	3	2	2
6.	What is switching in networking?	3	1	2
7.	List two key functions of IP.	3	1	2
8.	How many bits are there in an IPv4 address?	3	1	2
1.	Explain about packet switching with neat sketches	3	5	16
2.	Explain the IPv4 packet format with a neat sketch	3	5	16
3.	Describe about IPV4 frame format along with packet switching in details	3	5	16
4.	Explain about ARP and RARP in detail	3	5	16

UNIT IV

ROUTING

Routing and protocols: Unicast routing - Distance Vector Routing - RIP - Link State Routing – OSPF – Path-vector routing - BGP - Multicast Routing: DVMRP – PIM

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Circuit Switching	4	1	2
2.	What are the important attributes for a good routing algorithm	4	1	2
3.	Write any two difference between Connection oriented and Connection less service	4	1	2
4.	List the services provided by Data link layer	4	1	2
5.	What is unicast routing?	4	1	2
6.	What is the count-to-infinity problem in Distance Vector Routing?	4	2	2
7.	How does Link-State Routing differ from Distance Vector Routing?	4	2	2
8.	What is the role of Dijkstra's algorithm in Link-State Routing	4	2	2
1.	Explain in detail, about the ICMP with the neat diagram	4	5	16
2.	Explain in detail, about the DHCP with the neat diagram	4	5	16
3.	Explain the working of link state routing in details	4	5	16
4.	Define BGP protocol. Describe its routing functionality in details	4	5	16

UNIT V

DATA LINK AND PHYSICAL LAYERS

Data Link Layer – Framing – Flow control – Error control – Data-Link Layer Protocols – HDLC – PPP - Media Access Control – Ethernet Basics – CSMA/CD – Virtual LAN – Wireless LAN (802.11) - Physical Layer: Data and Signals - Performance – Transmission media- Switching – Circuit Switching

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Bandwidth	5	1	2
2.	What is Piggybacking?	5	1	2
3.	What is an Virtual LAN ?	5	1	2
4.	What parameters are used to measure the network performance	5	1	2
5.	What is the function of the Data Link Layer?	5	1	2
6.	Define flow control	5	1	2
7.	List any two framing techniques	5	1	2
8.	Why is flow control necessary in a network?	5	2	2
1.	Explain in details the design issues associating with framing in data link layer	5	5	16
2.	Explain in detail about the access method and frame format used in Ethernet	5	5	16
3.	List the responsibilities of data link layer in the Internet Models	5	5	16
4.	Explain about the error detection and error correction technique	5	5	16

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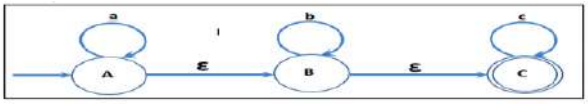
CS3501

COMPILER DESIGN

UNIT – 1
INTRODUCTION TO COMPILERS & LEXICAL ANALYSIS

Introduction- Translators- Compilation and Interpretation- Language processors -The Phases of Compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Finite Automata – Regular Expressions to Automata NFA, DFA – Minimizing DFA - Language for Specifying Lexical Analyzers – Lex tool.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define token,lexeme and pattern.	1	1	2
2.	Define assembler.	1	2	2
3.	Draw the syntax tree for the following statement:a=b*-c+b*-c.	1	2	2
4.	Mention few cousins of compiler.	1	2	2
5.	What are the possible error recovery actions in lexical analyzer?	1	2	2
6.	What is translator? Write down the steps to execute a program.	1	1	2
7.	Construct Deterministic Finite Automata to accept the regular expression : (0+1)* (00+11) (0+1)*	1	3	2
8.	Let M=({q0,q1}, {0,1}, δ, q0, {q1}). Be NFA where δ(q0,0)={q0,q1}, δ(q1,1) = {q1} δ(q1, 0)=φ, δ(q1, 1)={q0, q1} Construct its equivalent DFA.	1	3	2
	PART B			
1.	Describe the various phases of compiler and trace the program segment a:=b+c*4 for all phases.	1	2	16
2.	(i) Explain in detail about compiler construction tools. (ii)Discuss the role of lexical analyzer in details.	1	2	16

<table>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3.</td><td>(i)Explain the need for grouping of phases of compiler.
(ii)Explain specification and recognition of tokens.</td><td>1</td><td>2</td><td>16</td></tr>
<tr><td>4.</td><td>(i)Convert the given Є-NFA to suitable NFA.
 

(ii)Convert the given NFA to suitable DFA.
<table>
<tr><td>δ_N</td><td>a</td><td>b</td></tr>
<tr><td>$\rightarrow q_0$</td><td>{ q_0 ,q_1 }</td><td>{ q_0}</td></tr>
<tr><td>q_1</td><td>q_2</td><td>q_1</td></tr>
<tr><td>q_2</td><td>q_3</td><td>q_3</td></tr>
<tr><td>* q_3</td><td>-</td><td>q_2</td></tr>
</table></td><td>1</td><td>3</td><td>16</td></tr>
</table>

UNIT II

SYNTAX ANALYSIS

Role of Parser – Grammars – Context-free grammars – Writing a grammar Top Down Parsing - General Strategies - Recursive Descent Parser Predictive Parser-LL(1) - Parser-Shift Reduce Parser-LR Parser- LR (0)Item Construction of SLR Parsing Table - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC tool - Design of a syntax Analyzer for a Sample Language

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Explain the parsing techniques with a hierarchical diagram.	2	2	2
2.	What are the problems associated with Top Down Parsing?	2	1	2
3.	Write the production rules to eliminate the left recursion and left factoring problems.	2	2	2
4.	Consider the following Grammar: A-> ABd|Aa|a B-> Be|b Remove left recursion.	2	3	2
5.	Do left factoring in the following grammar: A-> aAB|aA|a B-> bB|b	2	3	2
6.	Write Rules to construct FIRST Function and FOLLOW Function.	2	2	2
7.	Show the following Grammar: S-> AaAb|BbBa A-> € B-> € Is LL(1) and parse the input string “ba”.	2	3	2
8.	Write the rules to construct the SLR parsing table	2	2	2
	PART B			
1.	Construct CLR parsing table for the following grammar S->AA A->aA|b	2	3	16
2.	Find FIRST and FOLLOW for the following grammar. S->iEtS|iEtSeS|a E->b	2	3	16
3.	Construct the predictive parser for the following grammar. S->(L)/a L->L,S/S	2	3	16

4.	Construct SLR parsing table for the grammar. >E+T|T T->T*F|F F->F*|a|b	2	3	16

UNIT III

SYNTAX DIRECTED TRANSLATION & INTERMEDIATE CODE GENERATION

Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type Checker- Equivalence of Type Expressions-Type Conversions. Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Back patching.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is syntax directed translation (SDD)?	3	1	2
2.	Draw the syntax tree and DAG for the following expression: (a*b)+(c-d)*(a*b)+b	3	2	2
3.	Differentiate between synthesized translation and inherited translation.	3	3	2
4.	When does dangling reference occur?	3	3	2
5.	Represent the following equation using DAG: a:=b*-c+c*-c. What is the purpose of DAG?	3	3	2
6.	Define constant folding.	3	2	2
7.	State the rules for type checking.	3	2	2
8.	Write quadruples, triples and indirect triples for the expression: -(a*b)+(c+d)-(a+b+c+d)	3	3	2
	PART B			
1.	Discuss the following in detail about the Syntax Directed Definition. i)Inherited Attributes ii) Synthesized attributes	3	2	16
2.	(i)What is three address code? Mention its types. How would you implement these address statements? Explain with examples.	3	2	16
3.	Explain the intermediate code representation for the flow of control statements with example.	3	2	16

4.	Explain the steps for constructing DAG. Construct the DAG for the following expression.((x+y)-((x+y)*(x-y)))+((x+y)*(x-y))	3	3	16

UNIT IV

RUN-TIME ENVIRONMENT AND CODE GENERATION

Runtime Environments – source language issues – Storage organization – Storage Allocation Strategies: Static, Stack and Heap allocation - Parameter Passing-Symbol Tables - Dynamic Storage Allocation - Issues in the Design of a code generator – Basic Blocks and Flow graphs - Design of a simple Code Generator - Optimal Code Generation for Expressions– Dynamic Programming Code Generation.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Differentiate static allocation and stack allocation.	4	2	2
2.	What is register descriptor and address descriptor?	4	2	2
3.	Write the definition of symbol table and procedure to store the names in symbol table	4	2	2
4.	What are the data structures used in symbol table?	4	2	2
5.	What are the limitations of stack allocation?	4	2	2
6.	Write a short note on Error Detection and Recovery.	4	2	2
7.	What is activation record? Write the various fields of Activation Record.	4	2	2
8.	Define backpatching.	4	2	2
	PART B			
1.	Explain in detail about the various issues in code generation with examples	4	2	8
2.	Discuss in detail about the activation tree and activation record with suitable example	4	2	16

3.	Write the intermediate code for the following code.
	if(a>b)
	x=a+b
	else
	x=a-b
		4	3	16

4.	Construct a syntax directed definition for constructing a syntax tree for assignment statements.	4	3	16

	S->id:=E E->E1+E2 E->E1*E2 E->-E1 E->(E1) E->id			

UNIT V

CODE OPTIMIZATION

Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks - Global Data Flow Analysis - Efficient Data Flow Algorithm – Recent trends in Compiler Design.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is reduction in strength?	5	1	2
2.	Define data flow analysis.	5	2	2
3.	Define bit stuffing.	5	2	2
4.	State the techniques for loop optimization.	5	2	2
5.	Define dead code elimination.	5	2	2
6.	What is code motion?	5	1	2
7.	What is code optimization?	5	1	2
8.	What is common sub-expression and how to eliminate it?	5	1	2
	PART B			
1.	Explain briefly about the principal sources of optimization	5	2	16
2.	Illustrate in detail about optimization of basic blocks	5	2	16

3.	Construct basic blocks and flowgraph for the following code:
	for i from 1 to m:
	for j from 1 to n :
	a[i,j]=5.0;
	for k from 1 to m:
	b[i,i]=1.0;
	print(“Done”)
		5	3	16

4.	Construct the DAG for the following Basic block & explain it.	5	3	16

	1. t1: = 4 * i 2. t2:= a [t1] 3. t3: = 4 * i 4. t4:= b [t3] 5. t5:=t2*t4 6. t6:=Prod+t5 7. Prod:=t6 8. t7:=i+1 9. i:= t7 10. if i<= 20 goto (1).			

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