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Roll No.....

**C-52**

**B.Tech (CSE-AIDS) III Semester Examinations (Dec 2025)**

**Data Structures (BT-AIDS-201A)**

**Time- 3hrs**

**Max.Marks-60**

**Attempt 5 questions in all, selecting one question from each unit and Question 1 is compulsory and each Question carries 12 marks.**

Q.1 Answer the following short questions (2 marks each):

- a) Differentiate between algorithmic complexity classes  $O(n)$ ,  $O(\log n)$ , and  $O(n^2)$  with examples.
- b) Write the recurrence relation for Merge Sort and solve its time complexity.
- c) How does stack memory differ from heap memory?
- d) Explain the significance of pointers in dynamic data structures.
- e) What is an AVL Tree? State the condition for rotation.
- f) Give one real-life example each of Stack and Queue application.
- g) What are the drawbacks of adjacency matrix representation for sparse graphs?

#### **UNIT – I**

Q.2 (a) Derive time and space complexity of recursive binary search. Discuss how it compares with iterative search.

(b) Design and analyze an optimized sorting algorithm for nearly sorted arrays.

Q.3 (a) Explain the difference between asymptotic notations (Big-O, Big-Theta, Big-Omega) with graphical representation.

(b) Propose a new algorithm that combines insertion and selection sort to minimize swaps.

#### **UNIT – II**

Q.4 (a) Derive the postfix expression and evaluate:  $(A + B) * (C / D - E) + F * G$ . Trace stack content for each step.

(b) Compare time complexity of linear queue, circular queue and priority queue implementations.

Q.5 (a) Design an algorithm using stack to check balanced parentheses in an expression with nested symbols.

(b) Prove how Quick Sort achieves  $O(n \log n)$  complexity on average and  $O(n^2)$  in the worst case.

### UNIT – III

Q.6 (a) Develop algorithms for inserting and deleting nodes in a doubly circular linked list. Discuss time complexity for each operation.

(b) Analyze the space-time trade-off between linked list and array implementations in memory-limited environments.

Q.7 (a) Implement stack and queue using a single linked list structure. Evaluate performance differences.

(b) Create a function to reverse a linked list recursively and iteratively. Compare both methods.

### UNIT – IV

Q.8 (a) Write an algorithm to construct a Binary Search Tree from a preorder traversal sequence. Analyze its complexity.

(b) Prove that AVL Tree rotations ensure logarithmic height. Discuss balance factor adjustment during insertion.

Q.9 (a) Design an algorithm to detect cycles in a directed graph using Depth First Search.

(b) Compare Prim's and Kruskal's algorithms for Minimum Spanning Tree with suitable examples.

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**B.Tech. (CSE-AIDS) III Semester Examinations (Dec 2025)**  
**Database Management System (BT-AIDS-203A)**

**Time- 3hrs**

**Max.Marks-60**

*Attempt 5 questions in all, selecting one question from each unit and Question 1 is compulsory and each Question carries 12 marks.*

Q.1

**Marks**

- (a) Explain the Data analysis in DBMS.
- (b) Describe the Candidate key and Alternate key with query generation.
- (c) Explain in short Data Manipulation Language.
- (d) Explain 2NF.
- (e) List out the ACID properties in DBMS.
- (f) Write the query generation by insert and update.

**UNIT-I**

- Q.2(a) Explain the ER diagram, make sets and correlate assuming the MNC/Industry details as an entity.
- Q.2(b) Write the difference between DDL and DML in query generation and explain in brief.
- Q.3(a) Write a query to find the top 5 customers with the highest total order amounts.
- Q.3(b) Differentiate between DDL, and DCL in SQL. Also write at least two commands for each

**UNIT-II**

- Q.4 Describe the purpose of window functions in SQL? List and explain how to use these functions in SQL with appropriate examples.
- Q.5(a) What is an anomaly in a relational database? Discuss the different types of anomalies that may occur in a relation, the problems they cause, and the resolution techniques used to eliminate them.
- Q.5(b) Write a query to find the manager for each employee in a company, even if the employee doesn't have a manager assigned.

**UNIT-III**

- Q.6 Explain the Normalization and data visualization. Explain 2NF & 3NF with examples.
- Q.7(a) Consider the relations p(A, B) and q(B, C), where q. B is a primary key and p.B is a foreign key referencing q.B. Consider the query  
Q:  $p \bowtie (\sigma_{B < 5}(q))$   
T:-  $p \text{ LO}(\sigma_{B < 5}(q))$

Where, LO denote the natural left outer-join operation. Assume that p and q contain no null values.

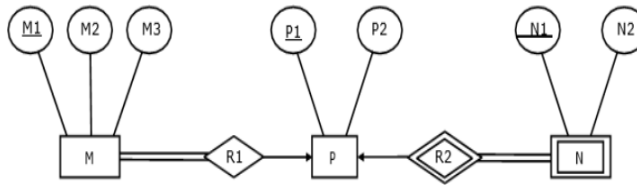
Are Q and T equivalent, if Q and T are not equivalent, then justify your reason.

Q.7(b) Suppose a relational schema R (A B C D E) and set of functional dependencies F: { A  $\longrightarrow$  B, B  $\longrightarrow$  E; C  $\longrightarrow$  D } Check out that relation is in 3NF or not? If not decompose it in 2NF.

**UNIT-IV**

Q.8 Discuss the different types of database models, such as Conceptual (ER) Model, Relational Model, and Physical Data Model.

Q.9(a) Consider the following ER diagram, draw minimum number of relations (tables) that can represent M, N, P, R1, R2.



Also, write MYSQL queries to link all tables you have drawn.

Q.9(b) For any scenario of your choice, design an ER diagram to represent the relationship between two or more entities.

The ER diagram must include the following mandatory things:

1. Strong and Weak Entity
2. Attributes — Key, Composite, Multivalued, and Derived
3. Different types of relationships (choose appropriately)
4. Explicitly show participation types (total/partial) in the diagram

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**B.Tech. (CSE-AIDS) III Semester Examinations (Dec 2025)**  
**Foundations of Data Science (BT-AIDS-205A)**

**Time- 3hrs**

**Max.Marks-60**

*Attempt 5 questions in all, selecting one question from each unit and Question 1 is compulsory and each Question carries 12 marks.*

	<b>Marks</b>
Q.1	
(a) What do you mean by the KDD Process?	2
(b) Describe the star schema and snowflake schema. Which is better, and why?	2
(c) Define Data Science and Big data.	2
(d) Outline the difference between structured data and unstructured data.	2
(e) Define Outlier. How do we calculate basic statistics like mean and median using NumPy?	2
(f) Differentiate/compare Quantitative and Qualitative Data with an example.	2

**UNIT-I**

Q.2(a) Examine the different facets of data with the challenges in their Processing.	6
Q.2(b) Elaborate about the steps in data process with a diagram or any 3 steps of it with suitable diagram and example.	6
Q.3(a) What is Data mining? Outline the architecture of Data Mining with neat diagram	6
Q.3(b) How can we represent categorical and numerical data graphically? Explain in brief.	6

**UNIT-II**

Q.4 Express each of the following scores as a Z Score: First Mary's intelligence quotient is 135, given a mean of 100 and standard deviation 15. Second, Mary obtained a score of 470 in the Competitive Examination conducted in April 2022, given a mean of 500 and a standard deviation of 100	12
Q.5(a) Compute Mean, Mode and median for the following 55,60,60,63,63,63,63,65,65.	6
Q.5(b) What is Z Score? Outline the steps to obtain a Z score.	6

**UNIT-III**

Q.6 A student appeared for two tests. He secured 80 in the first and 75 in the second. The mean and deviation for the first were 70 and 15 respectively, while for the second it was 64 and 12 respectively. What conclusion can you infer on comparing the students' performance for both exams?	12
Q.7(a) What is the purpose of error bar function in Matplotlib? Give an example.	6
Q.7(b) Define Interpretation R2 with an example.	6

#### UNIT-IV

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|--------|--|----|
| Q.8    | Showcase 3 dimensions drawing in matplotlib with corresponding Python code. List the Aggregate Pivot and Grouping function in Pandas | 12 |
| Q.9(a) | Define a Numpy array and list the attributes of numpy array with example.  | 6  |
| Q.9(b) | Describe the various methods of handling the missing data in Pandas.   | 6  |

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