



CS/BCA/EVEN/SEM-4/BCA-401/2017-18



**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

Paper Code : BCA-401

DATABASE MANAGEMENT SYSTEMS

Time Allotted: 3 Hours

Full Marks: 70

*The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable.*

Group-A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for *any ten* of the following:

1×10=10

(i) A relational database consists of a collection of

- | | |
|-------------|------------|
| (a) tables | (b) fields |
| (c) records | (d) keys |

(ii) Suppose R is a relation of n attributes $\{A_1, A_2, \dots, A_n\}$ as a function of n . How many super keys R has if the only key is A_1 ?

- | | |
|---------------|-------------------|
| (a) 2^n | (b) 2^{n-1} |
| (c) 2^{n-1} | (d) None of these |

(iii) Identify the correct statement:

- (a) Physical level Abstraction : Describes how a record is stored.
- (b) Physical level Abstraction : Describe how schema is stored in a data base.
- (c) Physical level Abstraction :Hides details of data types.
- (d) None of the above

Turn Over

- (iv) Consider the following SQL statements.

S1:

```
INSERT INTO employees (first_name, last_name, fname)
```

```
VALUES ('John', 'Capita', 'xcapit00');
```

S2:

```
SELECT instructor. ID, department. dept_name FROM instructor, department
```

```
WHERE instructor.dept_name = department.dept_name AND department.budget > 95000;
```

Identify the correct statement related to **S1** and **S2**:

- (a) Both **S1** and **S2** are Data Definition (DDL) Queries
 - (b) **S1** is a Data Control Query and **S2** is a Data Manipulation (DML) Query
 - (c) Both **S1** and **S2** are Data Manipulation (DML) Queries
 - (d) **S1** is a Data Definition (DDL) Query and **S2** is a Data Control Query
- (v) To remove a relation from an SQL database, we use the _____ command.
- (a) delete
 - (b) purge
 - (c) remove
 - (d) drop
- (vi) For relations $r_1(A, B, C)$, $r_2(C, D, E)$ and $r_3(E, F)$, assume that r_1 has 1000 tuples, r_2 has 1500 tuples and r_3 has 750 tuples. Maximum size of $r_1 \bowtie r_2 \bowtie r_3$ is
- (a) 1000 tuple
 - (b) 750 tuple
 - (c) 1500 tuple
 - (d) 1500750 tuple
- (vii) The descriptive property possessed by each entity set is
- (a) entity
 - (b) relation
 - (c) model
 - (d) attribute
- (viii) The entity set person is classified as student and employee. This process is called _____.
- (a) Generalization
 - (b) Specialization
 - (c) Inheritance
 - (d) Constraint generalization
- (ix) Which form has a relation that possesses data about an individual entity?
- (a) 2NF
 - (b) 3NF
 - (c) 4NF
 - (d) 5NF

- (x) Consider the following R1 relation and functional dependencies.

R1 (a, b, c, d, e, f)

FD1 : $a \rightarrow b, c, d, f$

FD2 : $d \rightarrow f$

- (a) relation R1 is in Boyce Codd normal form.
 - (b) relation R1 is in Third normal form.
 - (c) relation R1 is not in Third normal form due to transitive dependency.
 - (d) None of the above
- (xi) Which of these is not a feature of hierarchical model?
- (a) Organizes the data in tree-like structure.
 - (b) Parent node can have any number of child nodes.
 - (c) Root node does not have any parent.
 - (d) Child node can have any number of parent nodes.

Group-B

(Short Answer Type Questions)

Write any three of the following questions.

5×3=15

2. Explain the difference between external, internal and conceptual schemas. Distinguish between logical and physical data independence. 3+2=5
3. "All super keys are not candidate keys but the *vice-versa* is true". — Justify the statement.
4. Express division operation in terms of basic relational algebra operations.
5. What are the different parameters to evaluate the merits and demerits of Indexing and Hashing Schemes for database applications?
6. What is meant by spurious tuple?

Consider the following relational schema:

r(A, B, C, D, E, F, G)

The following functional dependency is held in the relation

$A \rightarrow B$; $B \rightarrow C$; $C \rightarrow D, E$; $F \rightarrow G$

Maintaining the functional dependency the relation r is broken as follows:

r1(A, B) ; r2(B, C) ; r3(C, D, E) ; r4(F, G)

Verify whether this decomposition is lossless or not.

2+3=5

Group-C

(Long Answer Type Questions)

Answer any three of the following questions.

15×3=45

7. (a) With proper diagram explain extended ER features (Generalization, Specialization and Aggregation).
(b) Draw a sample ER diagram for a college administration system. It should keep information like name and contact number of employees and students, attendants, salary statement of employees, department wise class and room allotment and examination result of students. 7+8=15
8. (a) Discuss about possible situations where hashing is preferred over indexing to search values.
(b) Discuss about possible situations where is indexing preferred over hashing to search values.
(c) Why is secondary index defined? Discuss some of the possible applications.
(d) Show the steps of Insertion in a B+ Tree of Order 3 for following values:
80, 50, 20, 70, 30, 100, 120, 60 2+2+(3+2)+6=15
9. (a) Explain different types of database anomalies and how normalization removes them.
(b) Write the algorithm to find out the candidate key from given a relation.
(c) Consider the following relation:
 $r(R) = \{ A, B, C, D, E, F, G, H, I \}$
Functional dependency is given below:
 $F = \{ A \rightarrow B, C \rightarrow D, E, F \rightarrow G, B \rightarrow GH, AF \rightarrow C, E \rightarrow I \}$
Determine the current normal form of the given relation. Decompose it upto BCNF.
(d) Explain with example why BCNF is stricter than 3NF? 5+4+3+3=15
10. Consider the following two schemas:
EMPLOYEE (EMP_ID, FNAME, ADDRESS, JOIN_DATE, SALARY, MANAGER#, DEPT_ID).
DEPT(DEPT_ID, DNAME, LOCATION).
Write appropriate SQL statements based on above tables.
(a) List the details of employees whose salary is less than the average salary.
(b) List the department id and the number of employees working in that department.
(c) List the name of employees whose name have exactly five letters.
(d) List the details of employees who are more than 10 years old in the company.
(e) Display the minimum and maximum salary of the employee. 3+3+3+3+3=15
11. Write short notes on any three of the following: 5×3=15
(a) Query Optimization Technique
(b) Inner Join and Outer Join
(c) Selection and Projection
(d) Multi-level Index
(e) Functions of DBA