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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 the following : $10 \times 1 = 10$

   i) If a set of attributes K, in a relation to schema R1 is a foreign key to R1 then

   a) every tuple of R1 has a distinct value for K

   b) K is key for some other relation

   c) K cannot have a null value for tuples in R1

   d) K is a primary key for R1.

ii) Which of the following features is supported in relational database model ?

a) Complex data types

b) Multi-valued attributes

c) Associations with multiplicities

d) Generalization relationships.

iii) SQL is a

a) Procedural Language

b) Non-procedural Language

c) Complex Language

d) None of these.

iv) The entity integrity constraint states

a) No primary key value can be null

b) A part of the key may be null

c) Duplicate object values are allowed

d) None of these.

v) What is the default format of date in Oracle ?

a) dd-mm-yy b) dd-m-yyyy

c) dd-mon-yy d) none of these.

vi) Which of the following aggregate functions works with characters ?

a) Max b) Avg

c) Count d) None of these.

vii) If we do not specify the constraint name for a constraint, the default name is in the format

a) SYS_Cn b) Cn_SYS

c) Cn d) None of these.

viii) The information about data in a database is called

a) Tera data b) Meta data

c) Hyper data d) None of these.

ix) Which data abstraction level specifies how data are stored in database ?

a) Physical b) Logical

c) View d) None of these.

x) In transaction, a WRITE operation will

a) read data from table and write on buffer

b) write on table

c) depend on application

d) lock a data for updating.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. Tables :

Student

Roll(PK)	Name	Dept id (FK)
1	ABC	1
2	DEF	1
3	GHI	2
4	JKL	3

Department

Dept id (PK)	Dept_Name
1	A
2	B
3	C

What will happen if we try to excute the following two SQL statements ?

Give proper explanation for your answer.

a) Update Student set Dept id = Null where Roll no = 1;

b) Update Department set Dept id = Null where Dept id = 1 ;

3. Let R (a,b,c) and S (d,e,f) be two relations in which d is the FK of S that referes to the primary key of R. Which of the following is true about the Referential integrity constraint ? Give proper explanation for your answer for choosing or not choosing each of the option.

a) Insert into R b) Insert into S c) Delete from R

d) Delete from S.

4. Let E1 and E2 be two entities in an E-R diagram with simple valued attributes. R1 and R2 are two relations between E1 and E2, where R1 is one-to-many and R2 is many-to-many. R1 and R2 do not have any attributes of their own. What is the minimum number of tables required to represent the situation in the relational model ? Give proper explanation for your answer.

5. 'All primary keys are super key but the converse is not true'. Explain with example.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

6. a) Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted. 8

   b) What is Metadata ? Explain with the help of a example. 3

   c) Differentiate between Delete and Truncate operations. 4

7. Consider the following schemas :

   Employee_master (EmpNo, Name, Job, Hiredate, Salary, manager_id, Dept_no, Age, E_sal)

   Perform the following queries on table (write appropriate SQL statement) (any *five*) 5 × 3

   a) List all employees' names and jobs whose job includes 'M' or 'P'.

   b) List all employees' names and their salaries whose salary lies between 15000 and 35000. (using between clause)

c) List all employees' names, salaries and 25% raise in salary.

d) Find how much amount the company is spending towards salary head.

e) List all employees' names and their manager_id whose manager_id is 7902, 7566 or 7789.

f) List the difference between minimum and maximum salaries of employees.

8. What is functional dependency ? Explain with example. Define 1NF, 2nd NF, 3rd NF and BCNF with example. 3 + 4 + 8

9. a) Write and explain GROUP BY, LIKE, DISTINCT, INNER JOIN and UPDATE commands in SQL. Also give one example for each.

b) Explain ACID properties. 10 + 5

10. Write short notes on any *three* of the following : 3 × 5

a) Multi-level index ?

b) Logical data independence and physical data independence

c) Codd's rule

d) The three-level architecture of DBMS

e) Query optimization.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. 3x5=15

2. Explain Relational Algebra using the operators {∂,∏,⋃,-,X and show that: A∩B = A ⋃ B – ((A-B)⋃(B – A))
3. Describe the three-level architecture of DBMS.
4. a) Explain the difference between external, internal and conceptual schemas.
   b) What is the highest NF of each of the following relations?
      i. R1(J, K, L) with FDs are J→K, J→ L, K → L
      ii. R2 (J, K, L, M) with FDs are J → KL, LM → K
5. Explain ACID properties of transactions.
6. "All primary keys are the super key but the converse is not true." Clarify.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. 3x15=45

7. i) Describe dense and sparse indices with diagram.

   ii) Define concept of aggregation. Give two examples where this concept is useful.

   8+ 7 =15

8. i) Describe the three tier architecture of the general DBMS.
   ii) Let R =(A, B) and S =(A, C) and let *r* (R) and r(S) be relations. Write relational algebra expression equivalent to the domain relational calculus expressions:
      a) {< a > | there exist b (<a, b> belongs to r^ b = 17}
      b) {<a, b, c > | <a, b> belongs to r^ <a,c> belongs to s}

   7+4+4 = 15

9. i) Why certain functional dependencies are called trivial functional dependencies?

ii) Use Armstrong's axioms to prove the soundness of the union rule.
iii) Compute the closure of the following set F of FDs for each relation schema

R = (A,B,C,D,E).
A->BC
CD->E
B ->D
E-> A.
List the candidate key for R. 7+4+4=15

10. i) Construct a B+ tree for the following set of values:
(2,3,5,7,11,17,19,23,29.31)
Assume that the tree is initially empty and values are added in ascending order. Contract B + tree for the cases where the number of pointers that will fit in one node is as follows

a. Four
b. Six
c. Eight

ii) Consider the followings tables
employee (emp_name, street, city)
works (emp_name, company_name, salary)
company (company_name, city)
managers (emp_name, manager_name)
Give SQL, expression for the following queries
a.Find the names and cities of residence of all employees who work for First Bank Corporation.
b.Find the name, street address and cities of residencies of all employees who work for First Bank Corporation and earn more than Rs. 100000.
c.Find all employees in the database who earn more than each employee of Small Bank Corporation. 9 + 6 =15

11. Write short notes on any three topics 5x3=15

a. Functional Dependency
b. Indexing
c. Mapping cardinalities
d. Query processing and optimization
e. Hashing

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DATABASE MANAGEMENT SYSTEM

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) Which of the following keyword is used in SQL to eliminate duplicate rows from the query result ?

a) NO DUPLICATE b) DISTINCT

c) UNIQUE d) none of these.

ii) Relational algebra is a ..... language.

a) non-procedural b) procedural

c) programming d) none of these.

iii) The ..... command returns the number of rows deleted.

a) Truncate b) Delete

c) Drop d) none of these.

iv) Which of the following clauses is used to enforce a condition on a SQL statement containing "group by" caluse ?

a) Where b) Having

c) Order by d) None of these.

v) Generalization is a ..... approach.

a) bottom up b) top down

c) both (a) & (b) d) none of these.

vi) Functional dependency is the dependency between

a) Tuples b) Attributes

c) Values d) None of these.

vii) COMMIT is a ..... statement.

a) TCL b) DCL

c) DML d) DQL.

viii) Which of the following is not an aggregate function ?

a) SUM b) MIN

c) MAX d) DISTINCT.

ix) Files of unordered records are called

a) heap files b) sorted files

c) hash files d) none of these.

x) The main goal of indexing is to

a) search an item faster from a table

b) insert an item faster into a table

c) delete an item faster from a table

d) none of these.

xi) The degree of a relationship describes

a) the number of attributes attached to a relation

b) the number of entities attached to a relation

c) the number of relations used to connect the entities

d) none of these.

xii) The full form of CODASYL is

a) Correlated Data System Language

b) Conference on Data System Language

c) Cohesion of Data Systems Language

d) None of these.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Differentiate between the following : $2\frac{1}{2} + 2\frac{1}{2}$

a) Delete and Truncate operations.

b) Referential integrity and entity integrity.

3. $R(A, B, C, D, E)$ and $A \rightarrow BC$, $B \rightarrow E$, $CE \rightarrow D$ in R. Find the candidate key for R.

4. What do you mean by degree of a relationship ? What is cardinality of a relationship ? What is a ternary relationship ? 1 + 1 + 2 + 1

5. Explain the disadvantages of file oriented approach.

6. "Minimal super key is candidate key". With a suitable example, justify the statement.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. What do you mean by fully functional dependency ? A relation $R(A, B, C)$ having FDs — $A \rightarrow B$, $A \rightarrow C$, $C \rightarrow B$. Is the relation in 2NF ? Can it be decomposed to 3NF ? Justify your answer. 5 + 10

8. Consider a relation —

Bank (Customer_name, account_no, account_type, balance, branch)

Solve the following queries using SQL, Relational Algebra and Tuple Relational Calculus. 5 × 3

i) Retrieve total balance amount for individual branch.

ii) Retrieve the name of the customers who have an account in "Dunlop" branch and balance less than Rs. 10,000.

iii) List the information of all customers of savings branch.

iv) Who have the minimum balance among all customers ?

v) Display the balance of thsoe customers whose balance starts with the letter '*A*'.

9. Consider the universal relation :

,$R = \{ A, B, C, D, E, F, G, H, I, J \}$ and the set of functional dependencies :

$AB \rightarrow C$

$A \rightarrow DE$

$B \rightarrow F$

$F \rightarrow GH$

$D \rightarrow IJ$

For the above relation R and functional dependencies, consider the decomposition $D = \{ R1, R2, R3 \}$ where

$R1 = \{ A, B, C, D, E \}$

$R2 = \{ B, F, G, H \}$

$R3 = \{ D, I, J \}$

Find out whether this decomposition is lossless or lossy.

10. Differentiate between various levels of data abstraction. What is data independence ? Explain the difference between physical and logical data independence. List any two significant differences between a file processing system and a DBMS. 5 + 2 + 4 + 4

11. Difference between the following : 10 + 5

a) Theta Join

b) Equi Join

c) Natural Join

d) Outer Join

Define the five basic operators of relational algebra with an example each.