



WEST BENGAL UNIVERSITY OF TECHNOLOGY

CS-601

DATABASE MANAGEMENT SYSTEM

Time Allotted: 3 Hours

Full Marks: 70

The questions are of equal value.

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. Answer any *ten* questions.

10×1 = 10

- (i) Check-pointing is associated with
(A) log based recovery (B) non-log based recovery
(C) both (A) & (B) (D) none of these
- (ii) The different levels of data abstraction are
(A) Physical level (B) Logical level
(C) View level (D) all of these
- (iii) The strategy for processing a query is improved by
(A) query evaluation (B) decomposition
(C) query optimization (D) none of these
- (iv) View is a
(A) temporary table (B) virtual table
(C) SQL statement (D) query
- (v) DML stands for
(A) Data Manipulation Language (B) Data Media Language
(C) Both (A) & (B) (D) None of these

- (vi) Closure of F is
 (A) F (B) ~~F⁺~~ (C) F⁻ (D) F⁺⁺
- (vii) Transaction follows
 (A) Acid properties (B) Non-preemption property
 (C) Preemption property (D) Starvation property ~~(E) Starvation property~~
- (viii) Relations produced from an ER-model will always be in
 (A) 1NF (B) 2NF (C) 3NF (D) 4NF
- (ix) BCNF stands for
 (A) Boyle Codd Normalization Form (B) Boyce Cold Normal Form
 (C) Boyce Codd Normal Form (D) None of these
- (x) Which of the following guarantees that, "A transaction is either performed in its entirety or not performed at all"?
 (A) Consistency (B) Durability
 (C) Isolation (D) Atomicity
- (xi) Which of the following is true?
 (A) a super key is always a candidate key
 (B) every 3NF schema is also in BCNF
 (C) generalization is a bottom-up design approach
 (D) none of these

9
10
5
5
10
40

GROUP B
(Short Answer Type Questions)

Answer any *three* questions.

3×5 = 15

2. (a) What do you mean by degree, cardinality of relationship?
 (b) What do you mean by data abstraction? Explain three levels of data abstraction?
3. / Discuss the ACID properties of a Database transaction. → 9.
4. (a) What is Data dictionary?
 (b) What do you mean by unary and binary operations in Relational algebra? Give example.

2+1+2

5

1+4

5. Explain with example "BCNF is stricter than 3NF". 5
6. Briefly explain two phase locking protocol. 5

GROUP C
(Long Answer Type Questions)

Answer any *three* questions.

3×15 = 45

7. Consider the following employee database, primary keys are underlined. 2+3+3+3+4

Employee(employee-name, street, city)
Works(employee-name, company-name, salary)
Company(company-name, city)
Manages(employee-name, manager-name)
Write SQL's for the queries given below:

- (i) Find the names of all employees who work for XYZ.
(ii) Find all employees in the database who live in the same cities as the companies for which they work.
(iii) Find all employees in the database who live in the same cities and on the same streets as do their managers.
(iv) Find all employees who earn more than the average salary of all employees of their company.
(v) Find the company that has the smallest payroll.

8. (a) Consider the following two sets of functional dependencies 4+3+2+3+3

$X = \{A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H\}$ and $Y = \{A \rightarrow CD, E \rightarrow AH\}$
Check whether or not they are equivalent.

- (b) Consider $R = (A, B, C, D, E)$ and set of functional dependencies $F = \{A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}$ to answer the following questions:

- (i) List the candidate keys for R.
(ii) Show that the following decomposition of the schema R into (A, B, C) and (A, D, E) is lossless-join decomposition if the above given set F of functional dependencies holds.

(iii) Compute the canonical cover F_c .

- (c) What normal form is the following relation in? Discuss stuff (D, O, N, T, C, R, Y)
FD's are $DO \rightarrow NTCRY, CR \rightarrow D, D \rightarrow N$.

Handwritten work for functional dependencies:

$A \rightarrow C$	$A \rightarrow C$	$A \rightarrow CD$	$A \rightarrow C$
$AC \rightarrow D$	$AC \rightarrow D \Rightarrow A \rightarrow D$	$E \rightarrow AH$	$A \rightarrow D$
$E \rightarrow AD$	$E \rightarrow A$		$E \rightarrow A$
$E \rightarrow H$	$E \rightarrow D$		$E \rightarrow H$
	$E \rightarrow H$		$E \rightarrow D$

Turn Over

9. Supreme products manufacture products like pressure cookers, cook wares, water purifiers, food processors etc. The company markets its product to wholesalers all over the country and dealers sell them to customer. The company has five regional offices. Sales persons contact dealers and explain about products, incentives offered, pairing programs for wholesalers and demonstration for customers etc. Dealers place orders with the sales persons attached with the regional office of their location. After receiving goods they make payments, which may be in installments. Company would like to develop a system to monitor sale of different products, performance of salespersons and order from wholesalers. Do the following:- 4+8+3
- (i) Identify entities, attributes and relationship
 - (ii) Draw an E-R diagram
 - (iii) Convert this to relational tables
10. (a) Explain the purpose of the checkpoint mechanism. How often should checkpoints be performed? 3+1
- (b) How does 'strict two-phase' and 'conservative two-phase' locking protocol differ. 4
- (c) Construct a B+ tree for the following set of key values – (3, 4, 6, 8, 12, 17, 19, 23, 29, 31) assume that the tree is initially empty, values are added in ascending order and the number of pointer in one node is 3. Also perform the following operations on B+ tree: (i) insert 10 (ii) insert 11 (iii) delete 29 7
- 11 (a) Describe Three-Schema architecture of DBMS. Define physical data independence and logical data independence. 3+2
- (b) Explain with examples the term super key, candidate key, primary key and alternate key. 5
- (c) Consider the file with $r = 3000$ records (fixed length) of size $R = 100$ bytes stored on a disk with block size $B = 1024$ bytes. Suppose each index entry in index file takes 15 bytes (9 bytes for index value, 5 bytes for pointer). What is the number of accessing blocks for clustering index? 5