



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 4th Semester Examination, 2023

**CMSACOR10T-COMPUTER SCIENCE (CC10)**

**DATABASE MANAGEMENT SYSTEMS**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

**GROUP-A**

1. Answer any **four** questions from the following: 2×4 = 8
- (a) What is the difference between a database schema and a database state?
  - (b) Differentiate between logical and physical data independence.
  - (c) What is meant by recursive relationship type?
  - (d) What is the difference between a key and a super key?
  - (e) Define a checkpoint.
  - (f) What is transitive dependency?
  - (g) "BCNF is stronger than 3NF" — Justify the statement.

**GROUP-B**

Answer any **four** questions from the following 8×4 = 32

2. (a) Consider the relational database as given below and write down expressions in (1+2+1)+2+2 relational algebra for the following queries.
- Material\_Master (Item\_id, Item\_name, Supplier\_id)  
Material\_Dts (Item\_id, Supplier\_id, Purchased\_date, Quantity, Item\_Cost)
- (i) Select the quantity of each purchased material alphabetically.
  - (ii) Select the names of materials which have the highest total quantity.
  - (iii) Replace the purchase date "10-05-2019" with "05-01-2020" of Item\_id 105.
- (b) What is the concept of a weak entity used in data modeling?
- (c) What do you mean by closure?
3. (a) Differentiate Domain Relational Calculus and Tuple Relational Calculus. 4+2+2
- (b) What is a view? How it is related to data independence?
  - (c) Explain left outer join and right outer join with examples.

4. (a) Explain the roles of a database administrator (DBA). 4+4  
 (b) Draw ER diagram showing cardinality:  
 A bill is sent to a customer. A customer may receive many bills. A clerk works in a bank. A bank has many clerks. Students appear for seats in a college. Each student can get almost one seat. A college has many seats. A student can sent many applications.
5. (a) What is called the closure of attribute set? Give an example. State the Armstrong's Axioms. 5+3  
 (b) Given a relation schema  $R(W, X, Y, Z)$  containing the set of FDs  $F = \{Z \rightarrow W, Y \rightarrow XZ, XW \rightarrow Y\}$ . Find out the number of Candidate keys in  $R$ .
6. (a) What are the different types of participation constraints? Give examples. 3+5  
 (b) Explain aggregation with a whole example containing corresponding schema design.
7. (a) Explain insertion, deletion and modification anomalies with examples. 4+4  
 (b) Given below are two sets of FDs  $F$  and  $G$  for a relation  $R(V, W, X, Y, Z)$ . Are they equivalent?  
 (i)  $F = \{W \rightarrow X, WX \rightarrow Y, Z \rightarrow WY, Z \rightarrow V\}$   
 (ii)  $G = \{W \rightarrow XY, Z \rightarrow WX\}$
8. (a) A set of FDs for the relation  $R(V, W, X, Y, Z)$  is  $F = \{V \rightarrow W, VW \rightarrow X, Y \rightarrow VXZ\}$ . Find a minimum cover for this set of FDs. 3+5  
 (b) Consider the universal relation  $R = \{A, B, C, D, E, F, G, H, I, J\}$  and the set of functional dependencies  $F = \{AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ\}$ . What is the key for  $R$ ? Decompose  $R$  into 2NF and then 3NF relations.