



VIT
Vellore Institute of Technology

Final Assessment Test - November 2019

Course: CSE2004 - Database Management Systems

Class NBR(s): 0612/0618/0630/0643/0665/0669/1867/
1868/2042/2285/4118

Slot: D2

Time: Three Hours

Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS EXAM MALPRACTICE

Answer ALL Questions

(10 X 10 = 100 Marks)

1. a) Compare the characteristics of Database System Approach with File processing systems. List the duties of a Database Administrator who is an actor in database systems. [5]
b) Define Schema and Subschema in Database Systems. Sketch the three level architecture for Database Management Systems. [5]
2. a) Draw the architectures and explain the components present in the architectures for Centralised Database Systems. [5]
b) Sketch the architecture of three level client server databases and explain it. [5]
3. Develop an Entity-relationship model for a banking system using the following.
 - Customer Entity with attributes customer-name, social-security_number, customer-street and customer-city where social_security_number is the key attribute.
 - Account entity with attributes account-number and balance where account number is the key attribute
 - Depositor relationship between customer and account entities which itself has an attribute access date.
 - A loan entity with loan_number and loan_amount as attributes which is related to the customer entity through a relationship called borrower.
 - A weak entity called payment with attributes payment_number and payment_amount and payment_date. This entity is related to the loan entity through the relationship
 - a. For this scenario, draw an E-R diagram by providing suitable mapping cardinalities. [3]
 - b. Convert this E-R diagram into database tables and explain them. [3]
 - c. If there are two types of accounts namely savings account and checking account with attributes interest rate for savings account and over draft amount for checking account, extend this E-R diagram to include these entities. [2]
 - d. Explain generalization and specialization using the extended E-R Diagram. [2]
4. Consider the following relation named Hostels

Relation name: Hostels

Student_ID	Hostel_Block	Fee
100	A_Block	20000
150	B_Block	25000
200	D_Block	40000
250	C_Block	30000
300	D_Block	40000
400	B-Block	25000

SEARCH VIT QUESTION PAPERS
ON TELEGRAM TO JOIN



Key :Student_ID

FDs :

1. Hostel_Block → Fee
2. Student_Id → Hostel_Block
3. Student_ID → Fee

- a. (i) Is this relation in First Normal Form? Why? [1]
(ii) Is this relation in Second Normal Form. If yes, explain. If not, convert into Second Normal Form. [2]

(iii) Is this relation in Third Normal Form. If yes, explain. If not, convert into Third Normal Form. [2]

b) Consider the following table named S P J
SPJ (S#, P#, J#)

S#	P#	J#
S1	P1	J1
S1	P2	J1
S2	P1	J1
S1	P1	J1

- i) Check whether this table has insertion and deletion anomalies. Explain. [1]
 - ii) Provide a non-loss decomposition by splitting the table either into two tables namely SP (S#, P#) and PJ (P#, J#) or into three tables namely SP (S#, P#), PJ (P#, J#) and SJ (S#, J#). [2]
 - iii) Which one of the above decompositions is non-loss, Explain? [2]
5. a) Is $B \rightarrow G$ in F^+ where
 $R = \{A, B, C, D, E\}$ and
 $F = \{B \rightarrow CD, E \rightarrow F, D \rightarrow E, B \rightarrow A, AD \rightarrow B, F \rightarrow G\}$ [4]
- b) Remove any redundant FDs from the following sets of FDs given in F, using the attribute closure algorithm where
 $F = \{AD \rightarrow B, B \rightarrow C, C \rightarrow D, A \rightarrow B\}$ [6]
6. a) List the Transformation Rules for Relational Algebra Operations that are used for algebraic query optimization. [5]
- b) You are given the following SQL Query. [5]
- ```

SELECT LNAME
FROM EMPLOYEE, WORKS_ON, PROJECT
WHERE PNAME = 'AQUARIUS' AND PNMUBER=PNO AND ESSN=SSN AND BDATE > '1957-12-31';

```
- Write the relational algebra expression that is equivalent to this query. Draw initial query tree for this expression. Find a final query tree that is efficient to execute.
7. a) Write the Properties of a transaction. Explain the need for using locks in concurrent execution of transactions. Draw the compatibility matrix for locks. [5]
- b) Define serializability. Give an example to show the serializability of transactions. How will you check whether a given schedule is serializable? [5]
8. a) Distinguish between immediate modification and deferred modification methods used in log based recovery protocol. Explain them using Redo and Undo operations for making recovery based on commit and abort operations stored in the log records. [5]
- b) State and explain the two phase locking protocol used for concurrency control. [5]
9. Develop a multilevel indexing structure with four keys in each level of the index tree for the key values 2, 35, 55 and 85. Explain the single and multi-level indexing techniques. You must create at least three levels of the tree by considering the first level bases as 2, 8, 15, 24, 35, 39, 44, 51, 55, 63, 71, 80 and 85. The primary key fields are 2, 5, 8, 12, 15, 21, 24, 29, 35, 36, 39, 41, 44, 46, 51, 52, 55, 58, 63, 66, 71, 78, 80, 82, 85 and 89.
10. Compare distributed databases and NOSQL databases based on ACID properties and BASE properties. Also explain the CAP theorem.

