KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

Level : B.Tech.
Year : II
Time : 2 hrs. 30 mins.

Course : AICS 201
Semester : I
F. M. : 40

SECTION "B"
[6Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. Define Database management system. Why is database system needed? [1+3]

2. Prepare an ER diagram for banking management system with necessary assumptions on your own.

3. Explain the ACID properties of transaction with an example of each.

4. Mention the situations when you would choose RDBMS or NoSQL. State the CAP. theorem. [2+2]

5. What are the different types of database failures? Describe the methods to recover a database from transaction. [1+3]

6. What is unique key constraint? How can database system handle deadlocks? [1+3]

7. Write short notes on: [2+2]
   a. Database Normaliazation
   b. Concurrency Control Techniques

SECTION "C"
[2Q. × 8 = 16 marks]

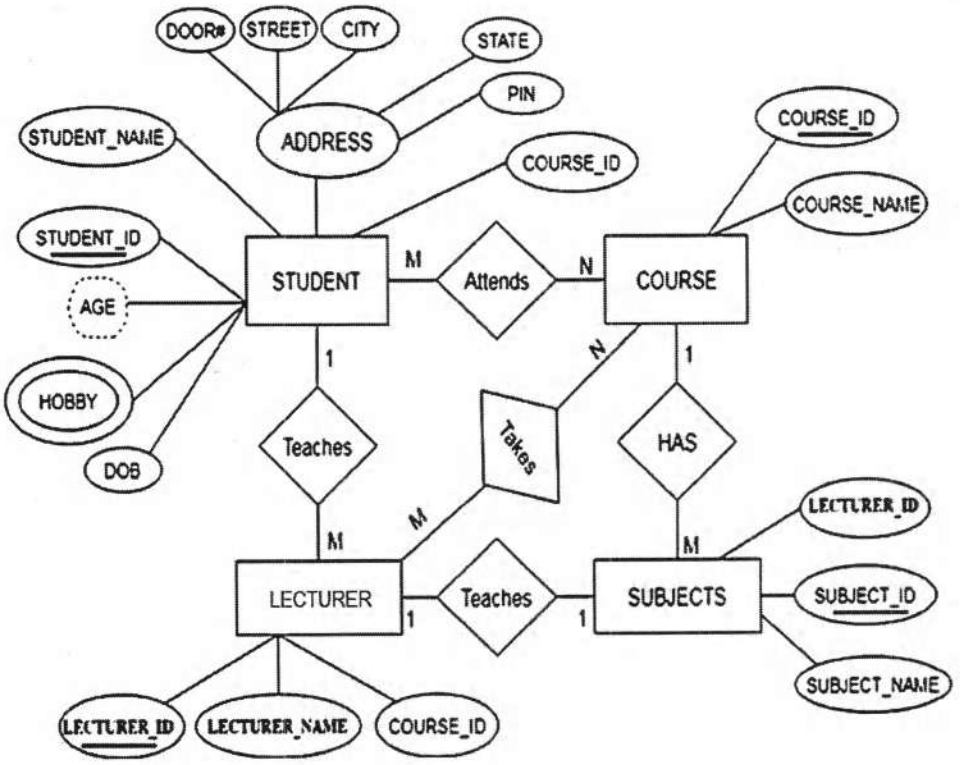
Attempt *ANY TWO* questions.

8. Consider the following relational database.
   - branch (branch-name, branch-city, assets)
   - customer (customer-name, customer-street, customer-city)
   - account (account-number, branch-name, balance)
   - loan (loan-number, branch-name, amount)
   - depositor (customer-name, account-number)
   - borrower (customer-name, loan-number)

   i. Write an SQL script for creating the table **branch** and **customer**. [2]
   ii. Write an SQL script for inserting the values in the **depositor** and **borrower** table. [2]
   iii. Give an expression in relational algebra and SQL to find the loan number for each loan of an amount greater than $1200. [2]
   iv. Write an SQL script for updating the value of branch name "Perryridge" as "Peryridge". [1]
   v. Write an SQL script for removing the data but preserving the table structure of the table **customer**. [1]

9. A. Consider a relation with schema R(A,B,C,D) with functional dependencies (FD's): $BC \rightarrow A$, $AD \rightarrow B$, $CD \rightarrow B$, $AC \rightarrow D$
   Find all the candidate keys of R in the above relation. Differentiate between Super key and Candidate key. [2+2]

B. Find the minimum number of tables required for the following ER diagram in relational model. [4]



10. Consider the following schedule.

T1	T2	T3	T4
	R(X)		
		W(X)	
		Commit	
W(X)			
Commit			
	W(Y)		
	R(Z)		
	Commit		
			R(X)
			R(Y)
			Commit

a. Prepare a precedence graph of the above schedule. [2]
b. Is this schedule conflict serializable? Why or why not? [2]
c. Differentiate between serial and serializable schedule. [2]
d. Why is preventing a deadlock more important than detecting and recovering from a deadlock? [2]