KATHMANDU UNIVERSITY
End Semester Examination
March, 2026

Level : B.E./BIT
Year : II
Time : 2 hrs. 30mins.

Course : COMP 232
Semester : I/II
F. M. : 40

SECTION "B"
[6 Q. × 4 = 24 marks]

Attempt ANY SIX questions.

1. Define relationship in the database management system and write its mathematical representation with an example.
2. Explain trivial and non-trivial functional dependencies with suitable examples.
3. Violation of what properties causes lossy decomposition? Explain with an example.
4. Assuming necessary constraints for normalization, breakdown an unnormalized table into 3NF and BCNF forms.
5. Define transaction and transaction state with a suitable example.
6. How do you detect a deadlock in transaction execution? Explain with the reference of Transactions T3 and T4
7. List the types of transaction failures. Draw the outline of a Transaction Log with some log entries of three transactions.
8. Define NoSQL database, characteristics and its comparison with SQL databases.

SECTION "C"
[2 Q. × 8 = 16 marks]

Attempt ANY TWO questions.

9. Define Closure of a set of a functional dependency with an example. Given the following STUDENT relation and constraints:
   Relation: STUDENT(RollNo, Name, Age)
   Constraints:
   i. RollNo is the primary key (must be unique).
   ii. Age must be between 18 and 25 (inclusive).
   a. Design a legal instance of this STUDENT relation in the form of a table with at least 3 tuples.
   b. Explain why your table is considered a legal instance.

P.T.O.

10. List and explain the essential components required in implementing Two-Phase Locking Algorithm. Explain the Two-Phase Locking Algorithm with reference to transactions T1 and T2.

11. Provided the schemas TEACHER(TeacherID (PK), Name, Department, Email), STUDENT(RollNo (PK), Name, Age, Department, Email), COURSE(CourseID (PK), CourseName, Credits, Department), GRADE(RollNo (FK), CourseID (FK), Grade, Semester) answer the following questions by designing an ER diagram:

a. Identify and represent strong entities and weak entities
b. Identify a relationship whose entities have total and partial participation.
c. Identify One-to-One and Many-to-Many Cardinality in any relationship.