

DATABASE MANAGEMENT SYSTEM

Time Allowed: 3 Hours

Sth Sen

Full Marks: 75

Answer to Question No.1 is compulsory and to be answered first.

This answer is to be made in separate loose script(s) provided for the purpose.

Maximum time allowed is 45 minutes, after which the loose answer scripts will be collected and fresh answer scripts for answering the remaining part of the question will be provided.

On early submission of answer scripts of Question No.1,
a student will get the remaining script earlier.

Answer any five questions from the rest.

1. A. Answer the following very briefly (any seven): 2x10
- i) What is data dictionary?
 - ~~ii)~~ What is DML?
 - ~~iii)~~ Define: Candidate Key?
 - iv) What is entity? Give two examples.
 - ~~v)~~ What is data privacy?
 - ~~vi)~~ What is schema?
 - ~~vii)~~ Name two popular relation database management softwares.
 - ~~viii)~~ Is SQL is a non-procedural language?
 - ix) Define data integrity.
 - ~~x)~~ What is the utility of project operation used in relation algebra?
 - xi) Why we need schedule of a set of concurrent transactions?
 - xii) Explain how view provides some security.
 - ~~xiii)~~ How deadlock is different from live lock?
 - ~~xiv)~~ Describe how strong and weak entity differs.
 - xv) Define multi-value functional dependency.
- B. Choose the correct answer (any five): 1x5
- ~~i)~~ Embedded SQL means – (a) use of procedural high level language like C etc in SQL statements. (b) use of SQL statements in procedural high level language like C etc, (c) calling SQL functions like MAX() etc in procedural high level language like C etc, (d) none of these.
 - ~~ii)~~ DBMS does not provide – (a) data independency, (b) integrity, (c) elimination of full redundancy, (d) Conflict resolution.
 - ~~iii)~~ Natural join also known as – (a) equi-join, (b) theta join, (c) outer join, ~~(d)~~ inner join.
 - ~~iv)~~ Un-Normalized database relation – (a) deletion, (b) insertion, (c) updation, ~~(d)~~ all three types of anomalies.
 - ~~v)~~ Entities can be related with each other by relation – (a) unary, (b) binary, (c) ternary, ~~(d)~~ all of these.
 - vi) Which is not a basic operation on a database system – (a) transaction, (b) lookup, (c) insertion, (d) deletion?
 - ~~vii)~~ BCNF decomposition maintains – ~~(a)~~ lossless decomposition, (b) lossy decomposition, (c) may be lossy type decomposition, (d) none of these.
 - viii) Which is not a direct Armstrong's axiom for functional dependency – (a) Reflexivity, (b) Augmentation, (c) Additive, (d) Pseudotransitivity.
2. ~~a)~~ List four significant differences between a file-processing system and a DBMS. ✓
- ~~b)~~ Explain the difference between physical and logical data independence. ✓
- ~~c)~~ What are five main functions of a database administrator? *2x3=6*
- 4+3+3

3. a) Mention the advantages of Relational Data Model over networked hierarchical data models.
 b) Give the definition of schema. Mention how it differs from schema instance.
 c) Explain the distinctions among the terms primary key, candidate key, and super key. 3+2+1+4
4. a) Why we need foreign key? Discuss that foreign key provides referential integrity of the database system.
 b) Contrast the concepts of aggregation and composition.
 c) Explain with suitable example how aggregate operations like generalization and specialization can be done in the ER diagram of a system. (2+2)+3+3
5. a) Describe the purpose of normalizing database.
 b) What are the main characteristics of functional dependencies that are used when normalizing a relation?
 c) Discuss the purpose of BCNF and describe how BCNF differs from 3NF. Provide an example to illustrate your answer. 2+4+4
6. a) Consider the following set of relations for a database system:
 T(T#, TName, Dept) – Defining the teachers
 S(Roll#, SName, City) – Defining the students
 Sub(S#, STitle) – Defining the subjects
 Taught(T#, S#) – Defining the activity of teacher
 Study(Roll#, S#, Marks) – Defining the activity of the student
 Now write the formula or expression in relational algebra for the following queries.
 i) Find the name of the students those who get the maximum marks.
 ii) Find the name of students those whose are studying all subjects.
 iii) Find all students who are studying in the Computer Science department.
 iv) Find the average marks obtained by the students in each subjects.
 b) Write the importance of data independency. (2x4)+2
7. a) What do you mean by relationally complete? Show that SQL is relationally complete.
 b) Explain how table or relation structure can be altered by SQL statement.
 c) Compare and contrast the tuple relation calculus with domain relational calculus. 2+3+2+3
8. a) Consider the following set of relations for a simple database system:
 Branch(branchNo, street, city, postcode)
 Staff(staffNo, fName, lName, position, sex, DOB, salary, branchNo)
 PropertyForRent(propertyNo, street, city, postcode, type, room, rent, ownerNo, staffNo, branchNo)
 Client(clientNo, fName, lName, telNo, prefType, maxRent)
 PrivateOwner(ownerNo, fName, lName, address, telNo)
 Viewing(clientNo, propertyNo, viewDate, comment)
 Now write the following queries in SQL:
 i) List all manager and supervisors. *not possible*
 ii) Find all owners with the string 'KOLKATA' in their address.
 iii) List the staff who work in the branch at 'new market'.
 iv) Find all staff whose salary is larger than the salary of at least one member of staff at branch 'BOO7'. 2+2+3+3
9. Define and give an example of transaction. Briefly discuss the ACID property of a transaction. What is serializable schedule – explain with a suitable example? 2+5+3
10. a) Discuss the type of problem that can occur with locking-based mechanisms for concurrency control and the actions that can be taken by a DBMS to prevent them.
 b) What is a timestamp? How do time timestamp-based protocols for concurrency control differ from locking based protocols? 5+5