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CICT PART II SECTION 3

DATABASE SYSTEMS

WEDNESDAY: 22 May 2019.   **Time Allowed: 3 hours.**

Answer ALL questions. Marks allocated to each question are shown at the end of the question.

QUESTION ONE

(a)   Describe two examples of commonly used database management systems.   (4 marks)

(b)   Analyse two forms of database maintenance.   (4 marks)

(c)   Early mainframe DBMS packages used the hierarchical structure.

        Explain this kind of structure.   (2 marks)

(d)   Explain four features of an entity-relation (E-R) model.   (4 marks)

(e)   Describe the following database distribution systems:

        (i)   Centralised systems.   (2 marks)

        (ii)   Heterogeneous distributed database systems.   (2 marks)

(f)   Enumerate two reasons why the overhead costs of using a DBMS are high.   (2 marks)
                                                                                              (Total: 20 marks)

QUESTION TWO

(a)   Examine how the concept of an object in an object oriented model differs from the concept of an entity in the entity-relationship model.   (2 marks)

(b)   Describe two possible solutions to achieve the functional principle of a statistical database.   (2 marks)

(c)   At XYZ College, students register and specialise in different courses. On registration, students are viewed to exist in the same class if they are in the same year and semester.

        Instructors specialises in specific course (s) and award students marks accordingly.

        Required:
        (i)   Using the details above, with proper explanations, formulate a database schema that is normalised to 4NF.
                                                                                                    (4 marks)

        (ii)   Write a Structured Query Language (SQL) statement that will retrieve class name, course name, instructor name, year and semester details for year 2019 semester 2.   (4 marks)

        (iii)   Draw an entity relationship diagram for the above scenario.   (8 marks)
                                                                                              (Total: 20 marks)

QUESTION THREE

(a)   Use the conceptual schema given below to answer the questions that follows:

        Students (name:string, age:integer, fees:real).

        (i)   Use a relational algebra statement to display all the students whose age is greater than 14 years.   (2 marks)

        (ii)   Write a relational algebra statement to display the students' name and fees.   (2 marks)

        (iii)   Write Data Description Language (DDL) statements that would be used to create the table using the schema given above.   (3 marks)

        (iv)   Write an SQL statement that would be used to delete the table created in (a) (iii) above.   (1 mark)

(b)   Study the students table below and answer the questions that follows:

Reg No.	Course	Fee (Sh.)
001	IT	35,000
002	Networking	28,000
063	Databases	62,000
094	Security	54,000
060	Networking	28,000

Required:

(i)   State the functional dependencies in the above table.   (2 marks)

(ii)   Identify the primary and the candidate keys in the table above.   (2 marks)

(iii)   Explain the type of anomaly that would occur by deleting the students' record whose registration number is "001".   (2 marks)

(iv)   Use normalisation to illustrate how you would solve the anomaly in question (b) (iii) above using a relevant normalisation form.   (2 marks)

(c)   Your start-up company wish to adopt a DDBMS. As the database administrator you are opposed to the move.

Justify four reasons to defend your position.   (4 marks)
(Total: 20 marks)

QUESTION FOUR

(a)   Outline four benefits of using a web browser to access a database.   (4 marks)

(b)   Describe the purpose of the following Structured Query Language (SQL) statements:

(i)   Start Transaction, Commit.   (2 marks)

(ii)   Rollback.   (2 marks)

(c)   Assess how concurrent control and recovery management support the ACID properties in DBMS. (2 marks)

(d)   Explain how hot spots are related to data interference problem.   (2 marks)

(e)   Justify why force writing is one of the most fundamental tool of recovery management.   (3 marks)

(f)   Justify why constraints such as debit-credit constraints should be enforced as part of a transaction rather than between transactions.   (3 marks)

(g)   Distinguish between "human-oriented" and "computer-oriented" database workflows.   (2 marks)
(Total: 20 marks)

QUESTION FIVE

(a)   Assess the significance of the following items in organisational databases:

(i)   Views.   (2 marks)

(ii)   Normalisation.   (2 marks)

(iii)   Data warehouses.   (2 marks)

(b)   System developers and integrators need to integrate existing databases to applications.

Examine three database integration options.   (6 marks)

(c)   Even with dynamism and capacity, database systems have standout limitations in their usage.

Explain two such limitations.   (4 marks)

(d)   Draw a labelled construct of a typical data-warehouse architecture.   (4 marks)
(Total: 20 marks)

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