Total No. of printed pages = 4

CSE 181501

Roll No. of candidate | | | | | | | | | | |

2022

B.Tech. 5th Semester End-Term Examination

CSE

DATABASE MANAGEMENT SYSTEMS

(New Regulation & New Syllabus)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer the following (MCQ/ Fill in the blanks) : (10 × 1 = 10)

(i) What is the highest level of abstraction in database management systems?

(a) View level (b) Conceptual level

(c) Logical level (d) None of the these

(ii) _____ is express database updates and queries.

(a) data definition language (b) data manipulation language

(c) data control language (d) transaction control language

(iii) Which type of data model is an extension of ER Model?

(a) relational data model

(b) object-based data model

(c) semi-structured data model

(d) structured data model

(iv) Which aspect of the schema can be displayed in the schema diagram?

(a) record type (b) data type

(c) constraints (d) all of the above

(v) Which of the following is a type of relational operation?

(a) Project operation (b) Union Operation

(c) Set Difference (d) All of the above

[Turn over

(vi) In _____ products, the rows in one table are combined with the rows in another table.

(a) cross (b) cartesian

(c) both (a) and (b) (d) none of these

(vii) Tables in second normal form (2NF):

(a) eliminate all hidden dependencies

(b) eliminate the possibility of a insertion anomalies

(c) have a composite key

(d) have all non key fields depend on the whole primary key

(viii) Given a schema as emp(empcode, name, street, city, state, pincode). For any pincode, there is only one city and state. Also, for a given street, city and state, there is just one pincode. In normalization terms, empdt 1 is a relation in

(a) 2 NF and hence also in 1 NF

(b) 3 NF and hence also in 2NF and 1NF

(c) 1 NF only

(d) BCNF and hence also in 3NF, 2NF and 1NF

(ix) Any value in the column can be used by a _____ function to generate the address.

(a) log (b) data

(c) hash (d) heap

(x) Consider the two account X and Y with two transactions:

read(X); X = X +100; write(X); read(Y); Y = Y – 100; write(Y);

The constraint that the sum of the account X and Y should remain constant is that of

(a) atomicity (b) consistency

(c) isolation (d) durability

2. (a) What is data independence? Illustrate it by explaining the three level schema architectures with a neat diagram. (4 + 4 = 8)

(b) Consider the schema:

employee(per-name, street, city)

works(per-name, com-name, salary)

company(com-name, city)

manages(per-name, man-name)

Give an SQL DDL definition for the tables of a database. Identify different possible constraints that should hold and include them in the DDL definition.

(Note: You can choose the best suitable attributes for assigning constraints.) (7)

3. (a) Consider the above relational database where the primary keys are underlined.

Give an expression in the relational algebra to express each of the following queries:

(i) Find the names of all employees who work for First Bank Corporation.

(ii) Find the names and cities of residence of all employees who work for First Bank Corporation.

(iii) Find the names of all employees in this database who live in the same city as the company for which they work. (2 + 3 + 2 = 7)

(b) Define functional dependency? Why are some functional dependencies trivial? Give an example. (2 + 2 + 1 = 5)

(c) Write down the different anomalies in a database with an example of schema. (3)

4. (a) Given R{ABCDE} and F = {A → B, BC → D, D → BC, DE → }. Are there any redundant functional dependencies in F? If so, remove them and decompose the relation R into 3NF relations. (2 + 5 = 7)

(b) Define dependency preserving decomposition? Consider a schema R(A, B, C, D) and functional dependencies A -> B and C -> D. Solve and find whether the decomposition of R into R1 (A, B) and R2(C, D) belongs to dependency preserving and/or lossless join? What is lossy decomposition? (2 + 4 + 2 = 8)

5. (a) Explain B+ trees? Discuss about its dynamic index structure? (3 + 7 = 10)

(b) Compare and Contrast Extendible Hashing with Linear Hashing? (5)

6. (a) Analyze which of the following concurrency control protocols ensure both conflict serializability and freedom from deadlock? (7)

(i) 2-phase locking

(ii) Time-stamp ordering

(b) Consider the transactions T1, T2, and T3 and the schedules S1 and S2 given below.

T1: r1(X);r1(Z);w1(X);w1(Z)

T2: r2(Y);r2(Z);w2(Z)

T3: r3(Y);r3(X);w3(Y)

S1: r1 (X);r3(Y); r3(X);r2(Y);r2(Z);

w3(Y); w2(Z);r1(Z);w1 (X);w1 (Z)

S2: r1(X); r3(Y); r2(Y); r3(X); r1(Z);

r2(Z); w3(Y); w1(X); w2(Z); w1(Z)

Analyze which one of the schedules is conflict-serializable? (8)

7. (a) Discuss the different authorization and authentication scheme used in DBMS. (8)

(b) How to handle deadlock in distributed databases? Explain it. (7)

$A^+ = A$

$B^+ = B$

AB

$(ABC)^+ = ABCD$

$ABD = ABDC$

ABC

AB

A, B, C, D