AUTUMN END SEMESTER EXAMINATION-2023
5th Semester B.Tech

DATABASE MANAGEMENT SYSTEM

CS 2004

(For 2022 (L.E), 2021 & Previous Admitted Batches)

Time: 3 Hours

Full Marks: 50

Answer any SIX questions.
Question paper consists of four SECTIONS i.e. A, B, C and D.
Section A is compulsory.
Attempt minimum one question each from Sections B, C, D.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable
and all parts of a question should be answered at one place only.

SECTION-A

1. Answer the following questions. $[1 \times 10]$

   (a) List any two roles of a database administrator (DBA)

   (b) Which level of data abstraction depicts how a record is stored in a database?

   (c) Consider the relation Flight(FlightNo, Source, Destination, Duration) where {FlightNo} and {Source, Destination, Duration} are the 2 candidate keys. What is the possible number of superkeys of the relation Flight?

   (d) Define recoverable schedule.

   (e) What is trivial functional dependency? Give an example.

   (f) If a relation A has 5 attributes and 200 tuples and another relation B has 12 attributes and 500 tuples. Find the no of attributes and tuples in the relation A×B.

(g) All conflict serializable schedules are also view serializable. True or False.

(h) List any two consequences of data redundancy.

(i) What are lock-based protocols?

(j) Define clustering index.

SECTION-B

2. (a) Explain the architecture of database management system with the help of a neat diagram [4]

   (b) Show that the two-phase locking protocol ensure conflict serializability and that transactions can be serialized according to their lock points. [4]

3. (a) Explain briefly about the ACID properties of a transaction. Also draw the transaction state diagram. [4]

   (b) Consider the following schedule S involving five transactions T1, T2, T3, T4 and T5: [4]

T1	T2	T3	T4	T5
	R(X)			
		W(X)		
		R(Y)		
W(Y)				
R(X)				
			R(X)	
			W(X)	
				R(Y)

R(X) denotes read operation on data item X by transaction Ti.

W(X) denotes write operation on data item X by transaction Ti.

i) Draw the precedence graph for the above schedule.

ii) Is the given schedule conflict and view serializable?

SECTION-C

4. (a) Consider the relational schema Tournament(Champion, Category, Participants, Judges, Day)with the following Functional Dependency set F. [4]

    {Category, Day}→ Champion

    {Category, Champion}→{Participants, Judges}

    {Day}→{Judges, Category}

    Find the canonical cover of F? Also find the candidate key of the above schema.

    (b) State the rules of armstrong axioms. Using armstrong axiom prove pseudo-transitivity rule. [4]

5. (a) Consider the relational schema Gallery(GallerySection, ArtistID, ArtID, Sold, Theme)with the following Functional Dependency set: [4]

    {GallerySection, ArtistID}→ ArtID

    ArtID→ Sold

    {ArtID, ArtistID}→ Theme

    The relation is decomposed into the following:

    Gallery1(GallerySection, ArtistID, ArtID)

    Gallery2(GallerySection, ArtistID, Sold)

    Is the above decomposition lossless and dependency preserving? Justify your answer.

    (b) Explain third normal form (3NF) with a suitable example. [4]

6. (a) Explain the advantages of database management system over the traditional file systems. [4]

    (b) Construct an E-R diagram for a car insurance company whose customers ownone or more cars each. Each car has associated with it zero to any number of recorded accidents. Each insurance policy overs one or morears and has one or more premium payments associated with [4]

it. Each payment is for a particular period of time, and has an associated due date, and the date when the payment was received.

SECTION-D

7. (a) Construct a B⁺tree for the following set of key values: [4]

(2, 3, 5, 7, 11, 17, 19, 23, 29, 31). Assume that the tree is initially empty and values are added in ascending order. the number of pointers that will fit in one node is four. Also perform following series of operation: *insert(9), insert(20), delete(19)*

(b) Indices speed query processing, but it is usually a bad idea to create indices one very attribute, and every combination of attributes, that are potential search keys. Explain why. [4]

8. (a) Consider the following employee database: [4]

employee (*ID, person_name, street,city*)
works (*ID,company_name, salary*)
Company (*company_name,city*)

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

i) Find the ID and name of each employee who does not work for "BigBank".

ii) Find the ID and name of each employee who earns at least as much as every employee in the database.

(b) In a relation FurnitureStore(FurnitureNo, FurnitureType, Price, Width, Height, Weight, DeliveryCharge), FurnitureNo identies FurnitureType and Price. Also, FurnitureType, Width, Height and Weight combined determines the DeliveryCharge. Width and Height of the furniture are dependent on Furniture No and Weight together. Find the non-prime attributes of FurnitureStore? [4]

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