Qn. Set Code-1

AUTUMN END SEMESTER EXAMINATION-2022
5th Semester B.Tech

DATABASE MANAGEMENT SYSTEMS

CS2004

(For 2021 (L.E), 2020 & 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 <u>*all parts of a question should be answered at one place only*</u>*.*

SECTION-A

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

   (a) What the difference between Composite Key and Composite Attribute? Justify your answer with example.

   (b) Consider the relation R with n attributes i.e., R (A_1, A_2, A_3, ..., A_n). How many numbers of Super key possible if A_1A_2 and A_2A_3 are two candidate keys for that relation?

   (c) Consider the following ER diagram. How many minimum numbers of relations required for that ER diagram?
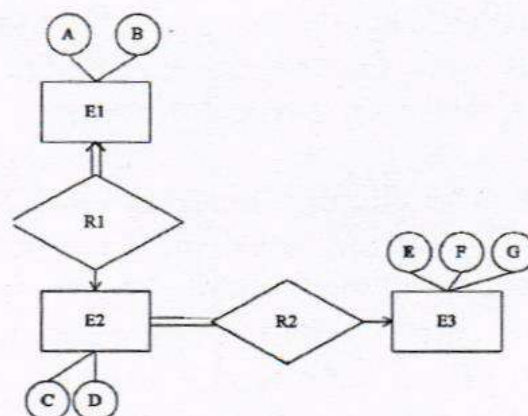
   (d) What is partial dependency? Explain with a suitable example.

   (e) If a Relation (R) contains two single valued attributes, then the relation is in BCNF. Justify your answer.

(f) What is Dirty Read and Blind Write in Concurrent execution of more than one transaction?

(g) What is conflict serializable schedule?

(h) Differentiate between B tree and B+ tree?

(i) What is the difference between a primary index and a clustering index?

(j) Consider two Relation A and B which are having M and N tuples respectively. Then find out the minimum and maximum number of tuples if natural join operation is performed between them.

SECTION-B

2. (a) What is Database Administrator? Define the role of Database administrator in DBMS   [1+3]

    (b) What do mean by a self-Referential Relationship? Explain it with ER diagram. How many minimum Table required for ER diagram to have a one-many self-Referential Relationship? Explain with proper schema and diagram. Also, mention all key values of each Table.   [1+3]

3. (a) Explain Armstrong's Axioms and additional inference rules with examples.   [4]

    (b) Consider the music database is designed to store details of a music collection, including the albums in the collection, the artists who made them, the tracks on the albums, and when each track was last played. Consider the following requirements: [4]
    * The collection consists of albums.
    * An album is made by exactly one artist.
    * An artist makes one or more albums.
    * An album contains one or more tracks
    * Artists, albums, and tracks each have a name.
    * Each track is on exactly one album.
    * Each track has a time length, measured in seconds.
    * When a track is played, the date and time the playback began (to the nearest second) should be recorded; this is used for reporting when a track was last played, as well as the number of times music by an artist, from an album, or a track has been played.

Construct an ER diagram for the above database and clearly mention the all the keys of each entity. Also specify mapping cardinality and participation contains for each relation in the ER diagram.

SECTION-C

4. (a) Consider the following schema: [2+2]
        Book (<u>Book id</u>, Book name, Cost, Author).
        Solve the following Queries using SQL:
        1) Retrieve the Book id of the 5 most costly books written by 'ABC'.
        2) Retrieve the Book id of 2nd costly book of each author without using the aggregation functions.

    (b) Consider the following Schema: [2+2]
        • Student (<u>Sid,</u> Sname, Gender, Age)
        • Course (<u>Cid</u>, Cname, Faculty)
        • Enroll (<u>Sid, Cid</u>)

        Solve the following Queries using Tuple Relational Calculus (TRC)
        1) Retrieve the name of the students who have enrolled in exactly two courses.
        2) Retrieve the location of students who have enrolled in all the courses taught by Korth and at least one question taught by Navate.

5. (a) Explain two phase locking protocol with a suitable example.   [4]
    (b) What is Time Stamp? Explain the timestamp-based protocol with suitable examples   [4]

6. (a) Given a relation R(X, Y, W, Z, P, Q) and the set   [3]
        F={XY→W, XW→P, PQ→Z, XY→Q}. Consider the decomposition R1(Z,P,Q)and R2=(X,Y,W,P,Q). Check whether this decomposition is lossless or lossy decomposition.

    (b) Relation R has eight attributes ABCDEFGH. Fields of R   [3]
        contain only atomic values.

        F={CH->G, A->BC, B->CFH, E->A, F->EG} is a set of functional dependencies (FDs) so that F + is exactly the set of FDs that hold for R. Find out all candidate keys for this relation.

(c) Find the minimal cover of the set of functional [2]
dependencies given; {A → C, AB → C, C → DI, CD → I,
EC → AB, EI → C}

SECTION-D

7. (a) Construct a B+ tree of order 5, for the numbers (10, 3, 8, [4]
20, 30, 15, 25, 5, 13, 12, 9, 11). Mention all steps for every
insertion during the creation of the tree using left biasing.

(b) Suppose we have an ordered data file with r =50000 records [4]
stored on a disk with block size B = 1024 bytes. File records
are of fixed size with record length, R = 256 bytes.

One primary index file of the given data file is created
based on ordering key field of the file. Assume that, the
length of each index entry is 16 bytes (key field size= 8
bytes and a block pointer size = 8 bytes).

Calculate the following:
a) Blocking factor of data file and index file.
b) Total number of blocks required for data file and
index file.
c) Number of block access on data file for a binary search.

8. (a) Consider the following Schedule(S) with five transactions [4]
(T1, T2, T3, T4, T5):

S: R1(A) R3(D) W1(B) R2(B) W3(B) R4(B) W2(C)
R5(C) W4(E) R5(E) W5(B)

Determine whether the given schedule is View serializable
or not. If yes then show all the possible equivalent serial
execution orders. Show all steps to justify your answer.

(b) Consider the following ER diagram. In this diagram, C and [4]
F are multi-valued attributes. Minimum how many the
number of the relational table are required for this model if
we make it (i) 1NF, (ii) 2NF, and (3) 3NF? Show the
attributes, primary key, and foreign key of each table

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