Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree (S,FE) Examination June 2022 (2015 scheme)

Course Code: CS208

Course Name: PRINCIPLES OF DATABASE DESIGN

Max. Marks: 100   Duration: 3 Hours

Limit answers to the required points.

PART A
Answer all questions, each carries 3 marks.   Marks

1   Explain three schema architecture with a diagram.   (3)

2   Discuss any three types of end users. How do they differ in accessing database system?   (3)

3   How a weak entity in an ER diagram is mapped to relational model. Give example.   (3)

4   Define primary key, candidate key and super key.   (3)

PART B
Answer any two full questions, each carries 9 marks.

5   Consider a movie database in which data is recorded about the movie industry. The data requirements are summarized as follows: (9)

- Each movie is identified by title and year of release. Each movie has a length in minutes. Each has a production company and each is classified under one or more genres (such as horror, action, drama...). Each movie has one or more directors and one or more actors appear in it. Each movie also has a plot outline. Finally, each movie has zero or more quotable quotes, each of which is spoken by a particular actor appearing in the movie.

- Actors are identified by name and date of birth and appear in one or more movies. Each actor has a role in the movie.

- Directors are also identified by name and date of birth and direct one or more movies. It is possible for a director to act in a movie.

- Production companies are identified by name and each has an address. A production company produces one or more movies.

Design an entity relationship diagram for the movie database. Specify key attributes of each entity type and constraints on each relationship type.

6   a)   How structured, semi structured and unstructured data vary in its storage and   (6)
          manipulation. Give proper examples for each type.

    b)   What is the difference between DDL and DML? Discuss any TWO DDL and any   (3)
         TWO DML commands in SQL.

7   a)   Convert the following ER diagram into a relational schema   (5)
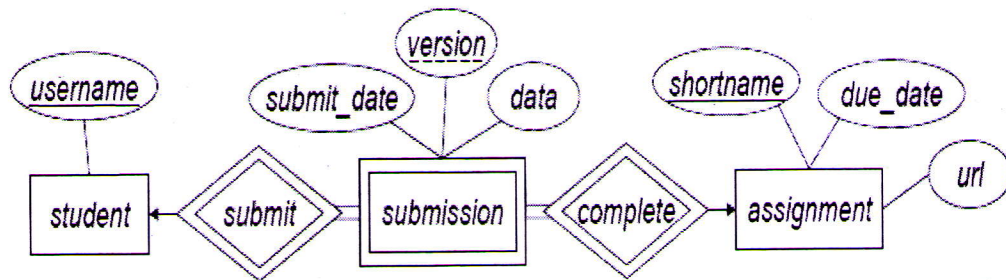
    b)   What is referential integrity constraint? Why it is important in a relational database?   (4)

PART C
Answer all questions, each carries 3 marks.

8   Explain any three aggregate functions in SQL with example   (3)

9   Demonstrate the working of GROUP BY clause in SQL.   (3)

10   Define the term functional dependency. Differentiate between trivial and non-trivial   (3)
     functional dependencies.

11   What do you understand by dependency preserving decomposition? Give an example.   (3)

PART D
Answer any two full questions, each carries 9 marks.

12   Consider the following schema and write SQL queries to find: (9)

STUDENT (**rollNo**, name, degree, year, sex, deptNo, advisor)

DEPARTMENT (**deptId**, name, hod, phone)

PROFESSOR (**empId**, name, sex, startYear, deptNo, phone)

COURSE (**courseId**, cname, credits, deptNo)

ENROLLMENT (**rollNo, courseId, sem, year**, grade)

TEACHING (**empId, courseId, sem, year**, classRoom)

PREREQ(**preCourseId, courseId**)

   i.   Get the employee Id, name and phone number of professors in the CS dept
        (deptNo= 3) who have joined after 1999.

   ii. Get the rollNo, name of students in the CSE dept (deptNo= 3) along with their
        advisor's name and phone number.

iii. Get the rollNo, name of students who have a lady professor as their advisor.

iv. Get the roll number and name of students whose gender is same as their advisor's.

13 a) How view is different from a table in SQL? Give the syntax of view declaration and illustrate the use with an example (4)

b) Define minimal cover. Let the given set of functional dependencies be: $\{B \rightarrow A, D \rightarrow A, AB \rightarrow D\}$. Find the minimal cover of E (5)

14 a) Given a relation R(X, Y, Z) and Functional Dependency set (5)
FD = $\{X \rightarrow Y$ and $Y \rightarrow Z\}$, determine whether the given R is in 3NF?
If not convert it into 3 NF.

b) Why do we need normalization? Demonstrate using suitable example. (4)

PART E

Answer any four full questions, each carries 10 marks.

15 a) Compare primary index and clustering index (3)

b) Illustrate with an example how searching for a record with search key field value is done using a B+-Tree. (7)

16 a) Demonstrate heuristic-based query optimization with proper example. (6)

b) What is multi-level index? When do you prefer multilevel index over single level index? (4)

17 a) Suppose that we have an ordered file with r=30000 records stored on a disk with block size B =1024 bytes. File records are of fixed length and are un-spanned with record length R =100 bytes. Assume that the file is ordered on the attribute V of length 9 bytes and the block pointer length P= 6 bytes. Compute the number of block access for the file (7)

i. Binary search (no index)

ii. Search a record using Primary index

Discuss the major issues associated with primary indexing

b) What are the properties of internal node of a B+ Tree? (3)

18 a) Consider a database with objects X and Y and assume that there are two transactions (6)
T1 and T2. Transaction T1 reads objects X and Y and then writes object X. Transaction T2 reads objects X and Y and then writes objects X and Y.

a. Give an example schedule with actions of transactions T1 and T2 on objects X and Y that results in a write-read conflict.

     b. Give an example schedule with actions of transactions T1 and T2 on objects X and Y that results in a read-write conflict.

     c. Give an example schedule with actions of transactions T1 and T2 on objects X and Y that results in a write-write conflict.

  b) Explain lost update and dirty read problems which may occur when concurrent transactions are not controlled.   (4)

19 a) What is two-phase locking (2PL) protocol? What is the purpose of 2PL? Explain how the purpose is achieved by taking suitable example.   (7)

  b) Which is the type of 2PL do not cause deadlock in schedule. Justify.   (3)

20 a) What do you mean by the term Big Data? What is the relevance of big data?   (4)

  b) When usage of RDF is not preferred?   (3)

  c) Explain ACID properties of a transaction by considering online movie ticket booking scenario.   (3)

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