B.E. II Examination June-July'2021
Computer Engineering
CER4C4 Database Management Systems

Duration: 3 Hrs Max. Marks: 60

Note: Attempt all the questions. Each question carries equal marks. Assume suitable data if necessary.

Q1. (a) Discuss about the DBMS components and their interactions.

(b) Describe the three-schema architecture. Why do we need mappings between schema levels? How do different schema definition languages support this architecture?

Q2. (a) Design a ER model to keep track of information for an art museum. Assume that the following requirements were collected:
· The museum has a collection of ART_OBJECTS. Each ART_OBJECT has a unique IdNo, an Artist (if known), a Year (when it was created, if known), a Title, and a Description. The art objects are categorized in several ways, as discussed below.
· ART_OBJECTs are categorized based on their type. There are three main types:PAINTING, SCULPTURE, and STATUE, plus another type called OTHER to accommodate objects that do not fall into one of the three main types.
· A PAINTING has a PaintType (like "oil", "watercolor"), material on which it is DrawnOn (like "paper", "canvas", woord"), and Style (like "modern", "abstract").
· A SCULPTURE or a STATUE has a Material from which it was created (like "wood", "stone", etc.) Height, Weight and Styles. A STATUE may have an Honoree, the person that is honored.
· An art object in the OTHER category has a Type (like "print", "photo") and Style.
· ART_OBJECTs are also categorized as PERMANENT_COLLECTION, which are owned by the museum (these have information on the DateAcquired, whether it is OnDisplay or stored, and Cost) or BORROWED, which has information on the Collection (from which it is borrowed), DateBorrowed, and DateReturned.
· ART_OBJECTs also have information desribing their Origin (like "Italian","Egyptian") and Epoch (like "Renaissance", "modern")· The museum keeps track of ARTISTs information, if known: Name, DateBorn, DateDied, CountryOfOrigin, Epoch, MainStyle, and Description. The Name is unique.
· Different EXHIBITIONs occur, each having a Name, StartDate, and EndDate. EXHIBITIONs are related to all the art objects that were on display during the exhibition.
· Information is kept on other COLLECTIONs with which the musuem interacts, including Name (unique), Type (like "museum", "personal"), Description, Address, Phone, and current ContactPerson.

(b) Discuss the guidelines to be chosen when doing ER design: Whether to use an attribute or an entity set, an entity or a relationship set, a binary or ternary relationship, or aggregation.

Q3. (a) Suppose R is a relation with attributes A_1, A_2, ..., A_n . As a function of n, tell how many superkeys R has, if:
i. The only key is A_1. **ii.** The only keys are A_1 and A_2. **iii.** The only keys are $\{A_1,A_2\}$ and $\{A_3,A_4\}$ **iv.** The only keys are $\{A_1,A_2\}$ and $\{A_1,A_3\}$

(b) What are integrity constraints? Define the terms primary key constraint and foreign

key constraint. How these constraints expressed in SQL?

Q4. (a) What are the problems faced when concurrent transactions are executed in an uncontrolled manner? Give example and explain.

(b) Write the following SQL queries, based on the database schema
Product(maker, model, type)
PC(model, speed, ram, hd, rd, price)
Laptop(model, speed, ram, hd, screen, price)
Printer(model, color, type, price)
i. Find the printers with the highest price.
ii. Find the laptops whose speed is slower than that of any PC.
iii. Find the model number of the item (PC, laptop or printer) with the highest price.
iv. Find the maker of the color printer with the lowest price.
v. Find the maker(s) of the PC(s) with the fastest processor among all those PC's that have the smallest amount of RAM.

Q5. (a) What are the differences among primary, secondary, and clustering indexes? How do these differences affect the ways in which these indexes are implemented? Which of the indexes are dense, and which are not?

(b) What is the difference between a file organization and an access method? What are the typical record-at-a-time operations for accessing a file? Which of these depend on the current file record?