Department of Computer Science and Engineering

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3rd Year 1st Semester B.Sc (Engg.) Final Examination-2020

Course Title: Database Management System **Course Code:** CSE 3105(Set-1)

Time: 1 Hours **Full Marks:** 50

Answer any 5 (Five) questions.

1. a) Mention the various kinds of database users. Describe sophisticated users. 5
   b) Explain the term distributed database management system (DDBMS). Mention the issues to be considered in the design of DDBMS. 5

2. Patient(ID, FirstName, SurName, Admission_Date, Dr_ID,Ward_No) 10
   Ailment(Ailment_ID, Name,Patient_ID)
   Ward(Ward_No, Ward_Name)
   Doctor(ID,SurName,First_Name,No_of_Patient, Ailment_ID)
   For the schema above, Write SQL to implement the following queries:
   i. List the surnames of all patient of 'Dr.Jones'.
   ii. List all the doctors who specialize in the ailment suffered by the patient whose surname is 'Thomas'.
   iii. List the ward number and ward name of the wards which have the most patients.
   iv. Show the Doctor's name who have the third highest no of patient.

3. a) Considering the relational schema given below. Write the following queries in relational algebra: 5
   Loan(loan_number,branch_name,amount)
   Borrower(customer_name,loan_number)
   Account(account_number,branch_name,balance)
   I. Find the names of all customers who have a loan at the 'Santosh'.
   II. Find the largest account balance in the bank.
   III. Find the names of all customers who have either an account or a loan or both.
   b) Define functional dependency. Describe the following functional dependency with appropriate example. 5
   I. Trivial Functional Dependency
   II. Non-Trivial Functional Dependency
   III. Multivalued Dependency
   IV. Transitive Dependency

4. A car-rental company maintains a vehicle database for all vehicles in its current fleet. For all vehicles, it includes the vehicle identification number, license number, manufacturer, model, date of purchase, and color. Special data are included for certain types of vehicles: 10
   • Trucks: cargo capacity
   • Sports cars: horsepower, renter age requirement
   • Vans: number of passengers
   • Off-road vehicles: ground clearance, drivetrain (four- or two-wheel drive)
   Construct an ER diagram for the car rental company database.

5. a) Define Indexing. Differentiate between Sparse Indexing and Dense Indexing. 3
   b) Suppose you are given the following information: 7
   Number of records=30000, block size=1024 bytes, Strategy= Unspanned, Record Size=100 bytes, Key size= 6bytes, pointer size= 9bytes. Find the average number of block access with or without indexing.

6. a) Define normalization of a database. Why do you need normalization in DBMS? 6
Normalize the following table with different level of Normalization.

EmpID	Name	Manager	Dept	Sector	Spouse/ Children
285	Carl Carison	Smithers	Engineering	6G	
365	Lenny	Smithers	Marketing	8G	
458	Hamer Simpson	Mr. Burns	Safety	7G	Marge,Bart, Lisa,Maggie

b) Suppose you are given a relation R(A, B, C, D, E) and functional dependency 4
FD: (A→B, B→C, C→D, D→A)
Check Whether it is in 2NF or 3NF or not.

7. a) Define Boyce-Codd Normal Form (BCNF). Suppose you are given a relation: 6
R(A, B, C, D, E) and functional dependency
FD: (AB→CDE, D→A,)
Check Whether it is in BCNF or 3NF or not.

b) Define decomposition. Suppose you are given a relation 4

R (A, B, C)

1	1	1
2	1	2
3	2	1
4	3	2

R1 (A, B)

1	1
2	1
3	2
4	3

R2 (B, C)

1	1
1	2
2	1
3	2

Is this relation lossless join decomposition? Justify your answer.

8. a. Classify Denial of Service (DoS) threat in DBMS. How SQL injection can be prevented-Explain with proper example. 5

b. Suppose the hash function is h(x) = x mod 8 and each bucket can hold at most two records. Show the form of extendable hash structure after each of the following insertion: 1, 4, 5, 7, 8, 2 and 20. 5