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MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY BHOPAL

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

EXAMINATION: END TERM EXAM

Month and Year: NOV. 2024

Course: B. Tech Semester: III Branch: Computer Science and Engineering

Subject Code: CSE212

Subject Name: Database Management Systems

Maximum Marks: 50 Marks

Duration: 180 minutes

Date: 21-11-2024

Time: 9.30 AM to 12:30 PM

Note: 1. Attempt all questions, 2. Assume necessary data, if required, and mention it clearly.

Q. No.	Questions	Marks	COs
Q1.	<p>(a) Consider the following relations:</p> <p>Doctor(SSN, FirstName, LastName, Specialty, YearsOfExperience, PhoneNum) Patient(SSN, FirstName, LastName, Address, DOB, PrimaryDoctor_SSN) Medicine(TradeName, UnitPrice, GenericFlag) Prescription(Id, Date, Doctor_SSN, Patient_SSN) Prescription_Medicine(Prescription Id, TradeName, NumOfUnits)</p> <p>Express the following queries in Relation Algebra</p> <ol style="list-style-type: none">List the first and last names of patients whose primary doctor named 'John Smith'.List the first and last name of doctors who are not primary doctors to any patient.For medicines written in more than 20 prescriptions, report the trade name and the total number of units prescribed.List the first and last name of patients who have no prescriptions written by doctors other than their primary doctors.List the SSN of patients who have 'Aspirin' and 'Vitamin' trade names in one prescription. <p>(b) Consider the following database:</p> <p>Student (student_id, student_name, address, branch) Subject (subject_id, subject_name, department_name) Enrolment (student_id, subject_id, marks)</p> <p>Express the following queries in SQL:</p> <ol style="list-style-type: none">Find the subject name of the subjects in which Ravi Kumar is enrolled (join).Find the subject ID of subjects that have an enrolment over 100 (group by aggregate).Retrieve the subject names and number of students in each subject that have more than five students, each of them with more than 40 marks (select group by having).Find the names of CSE students who are enrolled in every subject that is offered by the CSE department (exists).Find the name of the student who has scored the fifth highest marks in the DBMS subject.	05	CO1,3
Q2.	<p>(a) The book database is designed to manage comprehensive information about books, authors, publishers, contracts, and lawyers, as well as their interrelationships. Each book is uniquely identified by an ISBN, with attributes including the title and an optional reference to a previous edition's ISBN. Authors are identified by their Social Security Numbers (SSN) and have additional details such as first and last names. The system tracks relationships between books and authors. A book may have multiple authors with one author being the primary author and the remaining as co-authors. Each book is published by one publisher. Publishers are uniquely identified by their names and may</p>	04	CO2

	<p>have attributes such as the number of published books and multiple locations. Publishers sign contracts with authors to formalize agreements, with each contract having contract ID, start and end dates, and fees. Lawyers review these contracts and are uniquely identified by their license numbers, along with attributes such as name and years of experience. <u>ER Diagram</u></p> <p>(b) Consider $R = (A, B, C, D, E, F, G, H)$ with following FDs holding on it:</p> $H \rightarrow GD$ $E \rightarrow D$ $HD \rightarrow CE$ $BD \rightarrow A$ <p>Find the minimal cover of the given FDs.</p>	04	CO2
Q3.	<p>(a) Consider a relation $R(A, B, C, D, E)$ with the following functional dependencies holding on it. Check if R is in BCNF, if not then decompose into BCNF relations. Also, check whether the decomposition is dependency-preserving or not.</p> $A \rightarrow B$ $BC \rightarrow E$ $ED \rightarrow A$ <p>(b) Consider a relation schema $R(A, B, C, D)$ with the following functional dependencies: $A \rightarrow B$, $B \rightarrow C$, $C \rightarrow D$, and $D \rightarrow B$. Determine whether the decomposition of R into $R1(A, B)$ $R2(B, C)$, and $R3(B, D)$ is lossless or lossy.</p>	05	CO2
Q4.	<p>(a) Create an instance of the table Student with the attributes Student_ID (primary key), Student_Name, Age, Department (not null), Phone_Number (unique), City, and Email (unique) having at least twelve tuples in the tables. Assume these tuples are stored in a sorted file, and the file is stored on a disk where each disk block can contain at most four tuples. Give an example of primary index and secondary index on (department) that can be created on this table. Show the data entries of each of the indexes.</p> <p>(b) Suppose we have an unordered file of 30,000 records stored on a disk. With block size 1KB, file records are fixed length and are unspanned of size 100B. We have to create a secondary index on the Key field of the file of size 9B and a block pointer of size 6B then find the average number of blocks to search for a record using index and without index.</p>	05	CO4
Q5.	<p>(a) Consider the following schedule.</p> $W_4(y), R_1(x), R_1(w), W_1(w), W_2(x), C_2, W_3(w), C_3, W_4(w), C_4, W_1(z), C_1$ <p>Find the serializability order of the given schedule.</p> <p>(b) Explain Recoverable, Cascading rollback, Cascade less, and strict schedules with examples and define the relationship among schedules.</p> <p>(c) Consider the following transaction sequence using the basic Timestamp (TS) ordering protocol: $S: r1(A), r2(B), r3(C), r1(B), r2(C), r3(D), w1(C), w2(D), w3(E))$. Assume the timestamp values for the transactions are as follows: $TS(T1) = 20$, $TS(T2) = 30$, $TS(T3) = 10$. Analyze and determine the valid transaction sequence according to the basic TS ordering protocol.</p>	04 04 04	CO4