PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF INFORMATION SCIENCE
END TERM EXAMINATION - DEC 2022

Semester : Semester III - 2021

Course Code : CSA2003

Course Name : Sem III - CSA2003 - Relational Database Management Systems

Program : BCA

Date : 5-JAN-2023

Time : 9.30AM - 12.30PM

Max Marks : 100

Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.

PART A

ANSWER ALL THE FOLLOWING QUESTIONS   10 X 2 = 20M

1. What are the different types of JOIN used in SQL?

   (CO2) [Knowledge]

2. Which rules to be followed for using GROUP BY?

   (CO2) [Knowledge]

3. Can we use where clause with DDL commands? Justify your answer

   (CO2) [Knowledge]

4. What are the two wildcards used in conjunction with the LIKE operator?

   (CO2) [Knowledge]

5. State any two reasons of using SQL alias.

   (CO2) [Knowledge]

6. When can we say that X-->Y is trivial functional dependency?

   (CO3) [Knowledge]

7. In a schema with attributes A, B, C, D and E following set of functional dependencies are given
   {A -> B, A -> C, CD -> E, B -> D, E -> A} ,
   Show that the FD, CD -> AC holds true

   (CO3) [Knowledge]

8. FD set for relation STUDENT is:
   { STUD_NO->STUD_NAME, STUD_NO->STUD_PHONE, STUD_NO->STUD_STATE, STUD_NO->STUD_COUNTRY, STUD_NO -> STUD_AGE, STUD_STATE->STUD_COUNTRY }
   Find (STUD_NO, STUD_NAME)+, (STUD_COUNTRY)+

   (CO3) [Knowledge]

9. Consider an example to explain the lost update problem

   (CO4) [Knowledge]

10. Describe the ACID property.

    (CO4) [Knowledge]

PART B

ANSWER ALL THE FOLLOWING QUESTIONS   5 X 10 = 50M

11. Consider the company database
    Emp(Name,SSN,Salary,Superssn,gender,Dno)
    Dept(Dnum,Dname,Mgr_ssn)
    Dept_loc(Dnum,Dlocation)
    Dependent(Essn,Dept_name,sex)
    Works_on(Essn,Pno,hours)
    Project(Pname, Pnumber, Plocation, Dnum)
    Write Relational Algebra expressions for the following queries:
    1. Retrieve name,address,salary of employees who works for Research department.
    2. Retrieve names of all employees who works on all projects controlled by deptartment number.
    3. Retrieve the names of employees who have no dependents.
    4. Retrieve each department number, number of employees in department and their average salary.
    5. Retrieve the details of all emploeyees who either in department 4 or directly supervise an employee who works in department 4.

    (CO2) [Comprehension]

12. Given the database and few relational expressions below-

User

Id	Name	Age	Gender	OccupationId	CityId
1	John	25	Male	1	3
2	Sara	20	Female	3	4
3	Victor	31	Male	2	5
4	Jane	27	Female	1	3

Occupation

OccupationId	OccupationName
1	Software Engineer
2	Accountant
3	Pharmacist
4	Library Assistant

City

CityId	CityName
1	Halifax
2	Calgary
3	Boston
4	New York
5	Toronto

a. $\prod_{Name}(\sigma_{RAge>25}(User))$

b. $\sigma_{Id>2 \lor Age!=31}(User)$

c. $\sigma_{User.OccupationId=Occupation.OccupationId}(User \bowtie Occupation)$

d. $\rho_{Profession\ (ProfessionId, ProfessionName)}(Occupation)$

e. $\prod_{Name,Gender}(\sigma_{User.CityId=City.CityId \land CityName="Boston"}(User \bowtie City))$

Write SQL statements for each expression given above.

(CO2) [Comprehension]

13. Given R(elevator_no, building_no, building_name, capacity, staff_no, first_name, last_name, date_examined) with the following functional dependencies:
{(elevator_no → building_no,capacity), (building_no → building_name), (staff_no → first_name,last_name), (elevator_no,staff_no → date_examined)}
i. Find the highest normal form for R
ii. Normalize table R up to 2NF

(CO3) [Comprehension]

14. a. How is BCNF different from 3NF?
b. Examine the table given below-

branchNo	branchAddress	telNo	mgrStaffNo	name
B001	8 Jefferson Way, Portland, OR 97201	503-555-3618	S1500	Tom Daniels
B002	City Center Plaza, Seattle, WA 98122	206-555-6756	S0010	Mary Martinez
B003	14 – 8th Avenue, New York, NY 10012	212-371-3000	S0145	Art Peters
B004	16 – 14th Avenue, Seattle, WA 98128	206-555-3131	S2250	Sally Stern

i. Why is the table not in 3NF?
ii. Describe and illustrate the process of normalizing the data shown in this table to third normal form.
iii. Identify the primary, (alternate) and foreign keys in your 3NF relations.

(CO3) [Comprehension]

15. a. Why do we need transactions in DBMS?
b. Explain the state transition diagram for a database transaction.
c. How does Two phase protocol ensure Serializability? Explain with an appropriate example.

(CO4) [Comprehension]

PART C

ANSWER ALL THE FOLLOWING QUESTIONS   **2 X 15 = 30M**

16. i. Find the highest normal form for R(PQRSTUVWXYV) with FD are {PQ → R, P → ST, Q → U, U → VW and S → XY}
ii. Given R(staffNo, branchNo, branchAddress, name, position, hoursPerWeek) with
FDs = {(branchNo -->branchAddress), (branchAddress-->branchNo) , (staffNo--> name, position), (staffNo,branchNo -->hoursPerWeek) }. The decomposed set is {R1(branchNo, branchAddress), R2(staffNo, name, position), R3(staffNo, branchNo, hoursPerWeek)}.
Find whether the decomposition is
a. lossy or lossless
b. dependency preserving

(CO3) [Application]

17. Check whether the given schedule S1, S2, S3, S4, S5 are conflict serializable or not-
S1 : R1(A) , R2(A) , R1(B) , R2(B) , R3(B) , W1(A) , W2(B)
S2 : R2(X) , W3(X), W1(X), W2(Y), R2(Z), R4(X), R4(Y)
S3 : R4(A), R2(A), R3(A), W1(B), W2(A), R3(B), W2(B)
Convert the conflict serializable schedules to serial schedules.

<div align="right">(CO4) [Application]</div>

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