No of Pages : 3 **Course Code : 18XW32**

Roll No:
(To be filled in by the candidate)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

SEMESTER EXAMINATIONS, NOVEMBER 2019

MSc - SOFTWARE SYSTEMS Semester: 3

18XW32 DATABASE MANAGEMENT SYSTEM

Time : 3 Hours **Maximum Marks : 100**

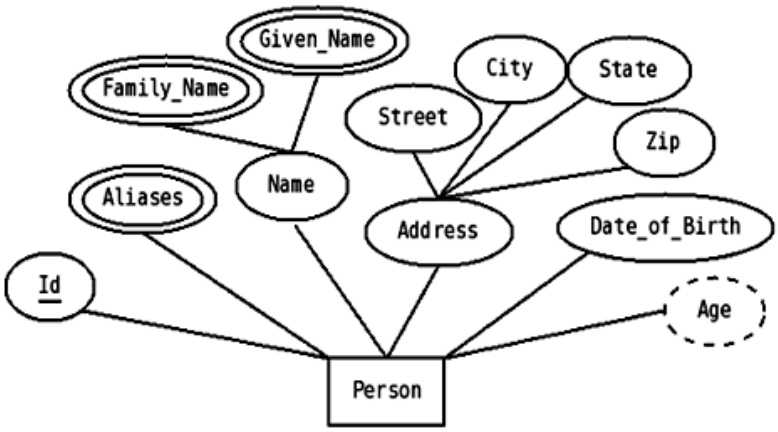
INSTRUCTIONS:

1. Answer **ALL** questions. Each question carries 20 Marks.
2. Subdivision (a) carries 3 marks each, subdivision (b) carries 7 marks each and subdivision (c) carries 10 marks each.
3. Course Outcome : Table

Qn.1	CO1	Qn.2	CO2	Qn.3	CO3	Qn.4	CO4	Qn.5	CO5

1. a) Define the following terms: data, database, DBMS, database system

b) (i) Transform the following E-R Diagram to Schema Diagrams. (3)



(ii) What is schema? Write above the three-schema architecture of DBMS. (4)

c) Construct an E-R diagram for university database with the following information:

Professors have an SSN, a name, an age, a rank, and a research specialty. Projects have a project number, a sponsor name, a starting date, an ending date and a budget. Graduate students have an SSN, a name, an age, and a degree program. Example: M.S or Ph.D. Each project is managed by one professor. Each project is worked by one or more professors. Professors can manage and /or work on multiple projects. Each project is worked by one or more graduate students (known as the projects research Assistants). When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in this case they can have a different supervisor for each one. Departments have a department number, a department name and a main office. Departments have a professor who runs the department. Professors works in one or more departments, and for each department that they work in a time percentage is associated with their job. Graduate students have a major department in which they are working on their degree. Each graduate student has another, more senior graduate student (known as student advisor) who advises him or her on what courses to take.

Design/Draw an ER diagram that captures the full information about the university. Use only the basic ER model, that is, entities, relationships, and attributes. Be sure to indicate any key and participation constraints with underlines and arrows.

2. a) "A UNION B can be defined for any two relations A and B" – Comment on this statement.

   b) (i) Differentiate the following.

   [1] Super key [2] Candidate key [3] primary key [4] Foreign key (3)

   (ii) Consider the following two relations Student and Course. Write relational algebra statements to perform inner join and all the outer join operations on Student and Course, also write the resultant relation of each. (4)

Student

Student Id	Student name	Course Code
S1	A	L7
S2	B	L1
S3	C	Null

Course

Course code	Course name	credit
L7	DBMS	4
L2	OS	3
L1	DM	5

   c) Consider the insurance database given below:

   person (*driver-id*, *name*, *address*)

   car (*license*, *model*, *year*)

   accident (*report-number*, year, *location*)

   owns (*driver-id*, *license*)

   participated (*driver-id*, *car*, *report-number*, *damage-amount*)

   Write relational algebra statements for the following requirements.

   1. Find the details of all cars with owner's data.
   2. Find the details of people who owned cars that were involved in Accidents in 2004.
   3. Find the details of the accidents with corresponding car data.
   4. Find the model of the car which participated in an accident in the year 2019.

3. a) Consider the following relational schema:

   Suppliers(sid:integer, sname:string, city:string, street:string)

   Parts(pid:integer, pname:string, color:string)

   Catalog(sid:integer, pid:integer, cost:real)

   Assume that, in the suppliers relation above, each supplier and each street within a city has a unique name, and (sname, city) forms a candidate key. No other functional dependencies are implied other than those implied by primary and candidate keys.

   Which of the following statement(s) is/are correct? Justify your answer.

   S1: The schema is in BCNF

   S2: The schema is in 3NF but not in BCNF

   S3: The schema is in 2NF but not in 3NF

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b) (i) Which of the following statement(s) is are TRUE? – Justify your answer. (3)

S_1 : The decomposition of the schema R(A, B, C) into R_1(A, B) and R_2 (A, C) is always lossless.

S_2 : The decomposition of the schema R(A, B, C, D, E) having AD → B, C → DE, B → AE and AE → C, into R_1 (A, B, D) and R_2 (A, C, D, E) is lossless.

(ii) Discuss insertion, deletion and modification anomalies. Why are they considered bad? Explain with examples. (3)

c) Consider the following relations for published books:

Book (Book_title, Author_name, Book_type, List_price, Author_ affiliation, Publisher)

Suppose the following dependencies exist:

Book_title → Publisher, Book_type

Book_type → List_price

Author_name → Author_affiliation

(1) What normal form is the relation in? Explain your answer.

(2) Apply normalization until you cannot decompose the relations further. State the reasons behind each decomposition.

4. a) Why is cascading rollback important in concurrent transaction execution?

b) (i) Consider the transactions T1, T2, and T3 and the schedules S1 and S2 given below.

```
T1: r1(X); r1(Z); w1(X); w1(Z)
T2: r2(Y); r2(Z); w2(Z)
T3: r3(Y); r3(X); w3(Y)
S1: r1(X); r3(Y); r3(X); r2(Y); r2(Z);
     w3(Y); w2(Z); r1(Z); w1(X); w1(Z)
S2: r1(X); r3(Y); r2(Y); r3(X); r1(Z);
     r2(Z); w3(Y); w1(X); w2(Z); w1(Z)
```

Which of the following statement(s) is/are correct? Justify your answer.

S1: Only S1 is conflict-serializable.

S2: Only S2 is conflict-serializable (3)

(ii) Discuss about concepts of serial, non-serial and conflict-serializable schedules examples. (4)

c) What is the two-phase locking protocol? How does it guarantee serializability? Explain with an example.

5. a) Write any two characteristics of sequential files. How does it differ from indexed sequential file?

b) (i) Consider the statement – "*We can have at most one primary or clustering index on a file, but several secondary indexes*". Analyze this statement and justify your answer with appropriate reasons. (3)

(ii) Why is database security important for an organization? Explain the available security measures in DBMS. (4)

c) What is hash collision? Explain the collision avoidance techniques in direct access files with examples.

FD/RL **/END/**