

**Fifth Semester B.E. Computer Science & Engg. Examinations February 2021****Database Management System**

Time: 3 Hours

Max. Marks: 100

**Note : Answer any five questions choosing one full question from each unit.****Unit - I**

- 1 a) Who are the different types of database end users? Discuss the main activities of each of them. 6

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- b) With the help of a neat diagram, explain the significance of three schema architecture. 6

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- c) What are the main characteristics of database approach? Explain briefly. 8

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**OR**

- 2 a) List and explain the advantage of using DBMS approach. 6

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- b) Explain database system environment with the help of a neat diagram. 8

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- c) Draw the E-R diagram for company database with the following scenario.

Company organized into DEPARTMENTS. Each department has unique name and a particular employee who manages the department.

Start date for the manager is recorded. Department may have several locations.

A department controls a number of PROJECTS. Projects have a unique name, number and a single location.

Company's EMPLOYEES Name, SSN, Address, Salary, Gender and Date of birth are recorded.

An employee is assigned to one department, but may work for several projects (not necessarily controlled by her department). Number of hours/week an employee works on each project is recorded.

Employee's DEPENDENTS are tracked for health insurance purposes (dependent name, birth date, relationship to employee). 6

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**Unit – II**

- 3 a) Consider the following relational schema and write the relational algebra queries for the following. 8

Sailors (SID, Sname, Rating, Age)

Boats(BID, Bname, Colour)

Reserves (SID, BID, Day)

i) Find the names of sailors, who have reserved all boats.

ii) Find the SID's of sailors with age over 20 who have not reserved a red boat.

iii) Find the names of sailors who have reserved a red or a green boat.

iv) Find the names of sailors who have reserved all boats called Interlake.

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- b) List aggregate functions commonly used in relational algebra. Give example for each of them. 6

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- c) With an example, explain the role of the following operations using relational algebra.

i) INTERSECT ii) MINUS iii) CARTESIAN PRODUCT

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**OR**

- 4 a) Consider the following relations and write relational algebraic expressions for the following.

Employee(Fname, Lname, SSN, Bdate, Address, Dno)

Department (Dname, Dnumber, Mgr\_SSN)

Dept\_Loc(Dnumber, DLocation)

Project(Pname, Pnumber, Plocation, Dnum)

Works\_on(ESSN, Pno, Hours)

Dependent (ESSN, Dname, Relationship)

i) Find the name and address of all employees who work for the ‘Research’ department.

ii) List the names of all employees with two or more dependents.

iii) Retrieve the names of employees who do not work on any project.

iv) Retrieve the average salary of all female employees.

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- b) Discuss the DIVISION operation in relational algebra with an example.

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- c) Discuss the different types of JOINS in relational algebra with an example.

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**Unit – III**

- 5 a) Explain the following clauses of select with an example for each of them.

i) GROUP BY ii) ORDER BY iii) HAVING

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- b) Consider the database for a college.

Student(Sid, Sname, gender, dob, dno)

Department(dno, dname)

i) Write a procedure which accepts the student number and displays the department in which he/she belongs to.

ii) Write a before delete trigger on student table.

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- c) Consider the following relational schema and write the SQL queries for the following.

Sailors (Sid, Sname, Rating, Age)

Boats(Bid, Bname, Colour)

Reserves(Sid, Bid, day)

i) Find the ids and names of the sailors who have reserved two different boats on the same day.

ii) Find the names of sailors who have reserved all boats.

iii) For each boat which was reserved by atleast 5 distinct sailors, find the boat id and the average age of sailors who reserved it.

iv) Find the name and the age of the youngest sailor.

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**OR**

- 6 a)** Explain the following clauses of select with an example for each of them.

- i) EXISTS AND NOT EXISTS
- ii) LIKE and BETWEEN

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- b)** Consider the database

Car(reg-no, model, colour, dop, SSN)

Owner (SSN, name, address)

- i) Write a procedure to list all cars and owner information purchased during the specific year.
- ii) Write a insertion trigger to check date of purchase must be less than the current date.

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- c)** Consider the following schema and write the queries using SQL:

Employee(Name, SSN, Address, gender, salary, Dno, SuperSSN)

Department(Dname, Dnumber, mgrSSN, mgr\_date)

Dependent (ESSN, D-name, gender, Bdate, Relation)

- i) Retrieve the name and address of all employees who work for research department.
- ii) For each department, retrieve the department number, number of employees in the department and their average salary.
- iii) For each employee, retrieve the employee's name and name of his or her immediate supervisor.
- iv) Retrieve the name of employees who have no dependents.

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**Unit – IV**

- 7 a)** Discuss the informal design guidelines for the good database design.

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- b)** List all the inference rules for Functional dependency.

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- c)** Consider the set of FDs,  $F = \{AB \rightarrow C, C \rightarrow A, BC \rightarrow D, ACD \rightarrow B, D \rightarrow E, D \rightarrow G, BE \rightarrow C, CG \rightarrow B, CG \rightarrow D, CE \rightarrow A, CE \rightarrow G\}$ . Find the minimal cover of F.

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**OR**

- 8 a)** Consider the following decompositions for the relation schema  $R = \{A, B, C, D, E, F, G, H, I\}$  and the set of functional dependencies.

$F = \{\{A, B\} \rightarrow \{C\}, \{A\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G, H\}, \{D\} \rightarrow \{I, J\}\}$ . Determine whether each decomposition has

- i) The dependency preservation property.
- ii) The lossless join property, with respect to F.

Also Determine which normal form each relation in the decomposition is in.

$D = \{R1, R2, R3, R4, R5\}$

$R1 = \{A, B, C, D\}$

$R2 = \{D, E\}$

$R3 = \{B, F\}$

$R4 = \{F, G, H\}$

$$R5 = \{D, I, J\}$$

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Please Turn Over

-4-

**5RCS01**

- b) Given below are two sets of FDs for a relation  $R(A, B, C, D, E)$ . Check whether they are equivalent.

$$F = \{A \rightarrow B, AB \rightarrow C, D \rightarrow AC, D \rightarrow E\}$$

$E = \{A \rightarrow BC, D \rightarrow AE\}$ . Write the algorithm to determine  $X^+$ , the closure of  $X$  under  $F$ .

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- c) Write the algorithm for finding a minimal cover  $F$  for a set of functional dependencies 'E'. Consider the relation  $R = \{A, B, C, D, E\}$  and functional dependency  $F = \{A \rightarrow BE, C \rightarrow BE, B \rightarrow D\}$ . Find the key for  $R$ .

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### Unit - V

- 9** a) Explain the desirable properties of transaction.

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- b) How is the concept of serializability useful for concurrency control?

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- c) Discuss the recovery techniques based on deferred update. Why is it called NO\_UNDO/REDO method?

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### OR

- 10** a) List the different types of failures. What is meant by catastrophic failure?

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- b) What are the two main operations that a transaction uses to access data from the database?

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- c) Discuss shadow paging. How is it different from log based recovery techniques? Mention some of its disadvantages.

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