**United College of Engineering and Research, Prayagraj**

**Department of Computer Science and Information Technology**

**Ist sessional Examination(2019-20)**

**B.Tech. (Vth Semester (CS & IT))**

**Database Management System(RCS-501)**

**Time: 2 hr.**  **Max. marks: 30**

**Section-A**

1. **Attempt all. (questions from CO1)**   **(5\*1=5)**
2. Define weak entity set.
3. Define participation constraints.
4. Differentiate between candidate key and super key.
5. 



1. **Attempt all. (questions from CO2) (5\*1=5)**
2. Discuss the entity integrity and referential integrity constraints. Why is each considered important?
3. What do you mean by schema diagram?
4. Explain division operator in relational algebra using example.
5. 



**Section-B**

1. **Attempt any three. (questions from CO1) (3\*2=6)**
2. Discuss the main characteristics of the database approach and how it differs from traditional file systems.
3. Explain specialization and generalization with example.
4. What are the responsibilities of the DBA and the database designers?
5. What is the difference between the two-tier and three-tier client/server architectures?
6. **Attempt any three. (questions from CO2) (3\*2=6)**
7. Consider following two tables:-

R1

|  |  |  |
| --- | --- | --- |
| **A** | **B** | **C** |
| a1 | b1 | c2 |
| a2 | b1 | c2 |
| a3 | b2 | c1 |

R2

|  |  |  |
| --- | --- | --- |
| **C** | **D** | **E** |
| c1 | d2 | e4 |
| c2 | d2 | e2 |
| c3 | d2 | e1 |

Evaluate the following:-

1. R1 natural join R2
2. R1XR2
3. Specify the following queries in SQL on the following database schema:-

Student(name, student\_number,class,major)

Course(course\_name,course\_number,credit\_hours,department)

Section(section\_identifier,course\_number,semester,year,instructor)

Grade\_Report(student\_number,section\_number,grade)

(i) Retrieve the names of all senior students majoring in ‘CS’ (computer science).

(ii) Retrieve the names of all courses taught by Professor King in 2007 and 2008.

1. Consider the following relation schema:

R = (A,B,C) S = (D,E,F)

Let relations r(R) and s(S) be given. Give an expression in the tuple relational calculus that is equivalent to each of the following:-

* + 1. πA (r)
    2. r Х s
    3. πA,F (σ C=D (r Х s))

1. Given the relational schema:

**ENROLL** (S#,C#, Section), S# is student number. **TEACH** (Prof, C#, Section), C# is course number.

**ADVISE** (Prof, S#), Prof is Thesis advisor of S#. **PRE-REQ**(C#, pre-C#), pre-C# is prerequisite course.

**GRADE** (S#, C#, grade, year) **STUDENT** (S#, Sname), Sname is student name.

Write the following queries in relational calculus.

* + 1. List all students taking at least one course that their advisor teaches.
    2. List those professors who teach more than one section of the same course.

**Section-C**

1. **Attempt any one. (questions from CO1) (4\*1=4)**
2. Consider the following information about a university database:
   1. Professors have an SSN, a name, an age, a rank, and a research specialty.
   2. Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date, and a budget.
   3. Graduate students have an SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.).
   4. Each project is managed by one professor (known as the project’s principal investigator).
   5. Each project is worked on by one or more professors (known as the project’s co-investigators).
   6. Professors can manage and/or work on multiple projects.
   7. Each project is worked on by one or more graduate students (known as the project’s research assistants).
   8. When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
   9. Departments have a department number, a department name, and a main office.
   10. Departments have a professor (known as the chairman) who runs the department.
   11. Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
   12. Graduate students have one major department in which they are working on their degree.
   13. Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.

Design and draw an ER diagram that captures the information about the university. Use only the basic ER model here; that is, entities, relationships, and attributes. Be sure to indicate any key and participation constraints.

1. Explain database system architecture.
2. **Attempt any one. (questions from CO2) (4\*1=4)**
3. Given the relational schema:

ENROLL (S#,C#, Section), S# is student number.

TEACH (Prof, C#, Section), C# is course number.

ADVISE (Prof, S#), Prof is Thesis advisor of S#.

PRE-REQ(C#, pre-C#), pre-C# is prerequisite course.

GRADE (S#, C#, grade, year)

STUDENT (S#, Sname), Sname is student name.

Write the following queries in tuple relational calculus.

1. List all students taking at least one course that their advisor teaches.
2. List those professors who teach more than one section of the same course.
3. List of students taking courses with Smith or Jones.
4. List the student number and course number who got grade “**A”.**
   1. Given the relational schema:

Employee (person\_name, street, city)

Works (person\_name, company\_name, salary)

Company (company\_name, city)

Manages (person\_name, manager\_name)

Write the following queries in relational algebra expression:-

* + 1. Find the names of all employees who earn more than every employee of Small Bank Corporation.
    2. Find the names of all employees who live in the same city and on the same street as do their managers.
    3. Increase the salary of all the managers by 10 percent.
    4. Find the company with the most employees.