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

**Department of Computer Science & Information Technology**

**IIIrd Sessional Examination (2017-18)**

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

**Database Management System**

**Subject Code:** NCS-502

**Time:** 2.00 hours **Max. Marks:** 30

**Note:** There are three sections in this paper. All sections are compulsory.

**Section-A**

**Note:** All questions are **compulsory**. Each question has equal marks. **10\*1=10**

1. Define partial key.
2. What are anomalies in database?
3. Define 4NF.
4. Define functional dependency.
5. What is data independence?
6. Define cascadless schedule.
7. Define deadlock in DBMS.
8. Explain division operation in relational algebra with example.
9. Define candidate key.
10. Define canonical cover of set of FDs.

**Section-B**

**Note:** Attempt any **five** questions. Each question has equal marks. **5\*2=10**

1. Define all responsibilities of database administrator.
2. Explain Two Phase locking protocol with an example.
3. Is the decomposition in 3NF always dependency preserving and lossless? Explain with an example.
4. Consider the following relation schema R(A,B,C,D,E) and FD’s A🡪BC, C🡪A,D🡪E, F🡪A, E🡪D

Is the decomposition of into R1(A, C, D), R2(B,C, D) AND R3(E,F,D) lossless?

1. Describe hierarchical data model.
2. Draw schema diagram for Bank database.

**Section-C**

**Note:** Attempt any **two** questions. Each question has equal marks. **2\*5=10**

1. 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. Consider the following relations:

Student(*snum:* integer, *sname:* string, *major:* string, *level:* string, *age:* integer)

Class(*name:* string, *meets at:* string, *room:* string, *fid:* integer)

Enrolled(*snum:* integer, *cname:* string)

Faculty(*fid*: integer, *fname:* string, *deptid:* integer)

The meaning of these relations is straightforward; for example, Enrolled has one record

per student-class pair such that the student is enrolled in the class.

Write the following queries in SQL. No duplicates should be printed in any of the answers.

1. Find the names of faculty members who teach in every room in which some class is taught.
2. Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.
3. For each level, print the level and the average age of students for that level.
4. For all levels except JR, print the level and the average age of students for that level.
5. For each faculty member that has taught classes only in room R128, print the faculty member’s name and the total number of classes she or he has taught.
6. Describe Time Stamp based locking protocol and also explain its working by taking an example.