

Motilal Nehru National Institute of Technology Allahabad
Department of Computer Science and Engineering
B.Tech - VI Sem IT, Mid-Sem Exam, Feb 2018
Database Management Systems (CS 1605)

Time 90 Mins

M.M. 20

All questions are compulsory. Assume any missing data and mention it at the top of answer.

- Ques 1** Consider the following relations containing airline flight information: **5*2=10 marks**
Flights(flno: integer, from: string, to: string, distance: integer, departs: time, arrives: time)
Aircraft(aid: integer, aname: string, cruisingrange: integer)
Certified(eid: integer, aid: integer)
Employees(eid: integer, ename: string, salary: integer)

Note that the Employees relation describes pilots and other kinds of employees as well; every pilot is certified for some aircraft (otherwise, he or she would not qualify as a pilot), and only pilots are certified to fly. Write the following queries in relational algebra and tuple relational calculus.

- a) Find the names of pilots who can operate planes with a range greater than 3,000 miles but are not certified on any Boeing aircraft.
- b) Find the eids of employees who make the highest salary.
- c) Find the eids of employees who make the second highest salary.
- d) Find the eids of employees who are certified for exactly three aircraft.
- e) Find the eids of pilots certified for some Boeing aircraft.

- Ques 2** a) Consider the relation R, which has attributes that hold schedules of courses and sections at a university; $R = \{\text{Course_no, Sec_no, Offering_dept, Credit_hours, Course_level, Instructor_ssn, Semester, Year, Days_hours, Room_no, No_of_students}\}$. Suppose that the following functional dependencies hold on R: $\{\text{Course_no}\} \rightarrow \{\text{Offering_dept, Credit_hours, Course_level}\}$
 $\{\text{Course_no, Sec_no, Semester, Year}\} \rightarrow \{\text{Days_hours, Room_no, No_of_students, Instructor_ssn}\}$
 $\{\text{Room_no, Days_hours, Semester, Year}\} \rightarrow \{\text{Instructor_ssn, Course_no, Sec_no}\}$
Determine the sets of attributes which form keys for R. **2*2=4 marks**

- b) Define the concept of aggregation. Give two examples where the concept of aggregation is useful.

- Ques 3** Use Armstrong's rule to verify the soundness of the following inference rules: **2*3=6 marks**
a) Union rule.
b) Decomposition rule
c) Pseudotransitivity rule