Roll Number:_____ No. of Pages: 02

National Institute of Technology, Hamirpur (H.P.)

Department of Computer Science and Engineering

B. Tech. Dual Degree: Semester- V (CSE)	Course Code: CSD-313 Course Name: Database Management Systems
December 12, 2020	Wednesday, 10:00 – 12:00 Hrs
Time: 2 Hrs., M. Marks: 50 Marks	Name Of Faculty: Dr. Vijay Kumar

Note: Attempt all questions in proper sequence. Assume missing data, if any, suitably.

Q1 Computer Sciences Department frequent fliers have been complaining to Dane County Airport officials about the poor organization at the airport. As a result, the officials decided that all information related to the airport should be organized using a DBMS, and you have been hired to design the database. Your first task is to organize the information about all the airplanes stationed and maintained at the airport. The relevant information is as follows: 8 Marks

- Every airplane has a registration number, and each airplane is of a specific model.
- The airport accommodates a number of airplane models, and each model is identified by a model number (e.g., DC-10) and has a capacity and a weight.
- A number of technicians work at the airport. You need to store the name, SSN, address, phone number, and salary of each technician.
- Each technician is an expert on one or more plane model(s), and his or her expertise may overlap with that of other technicians. This information about technicians must also be recorded.
- Traffic controllers must have an annual medical examination. For each traffic controller, you must store the date of the most recent exam.
- All airport employees (including technicians) belong to a union. You must store the union membership number of each employee. You can assume that each employee is uniquely identified by a social security number.
- The airport has a number of tests that are used periodically to ensure that air-planes are still airworthy. Each test has a Federal Aviation Administration (FAA) test number, a name, and a maximum possible score.
- The FAA requires the airport to keep track of each time a given airplane is tested by a given technician using a given test. For each testing event, the information needed is the date, the number of hours the technician spent doing the test, and the score the airplane received on the test.

1. Draw an ER diagram for the airport database. Be sure to indicate the various attributes of each entity and relationship set; also specify the key and participation constraints for each relationship set. Specify any necessary overlap and covering constraints as well (in English).
2. The FAA passes a regulation that tests on a plane must be conducted by a technician who is an expert on that model. How would you express this constraint in the ER diagram? If you cannot express it, explain briefly

Q2 Consider the relation scheme (Trans_No, Item_No, Price, Sold_Quantity, Seller, District_Seller). The functional dependencies are given below: 8 Marks

- Trans_No, Item_No → Sold_Quantity
- Item_No → Price
- Seller → District_Seller
- Trans_No → Seller

What are the candidate keys of this relation? What is the highest norm form of this relation? Transform this relation to its next higher form. Use table's representation during transformation.

Q3 Consider the following items 8 Marks

23, 65, 37, 60, 46, 92, 48, 71, 56, 59, 18, 21, 10, 74, 78, 15, 16, 20, 24, 28, 39, 43, 47, 50, 69, 75, 8, 49, 33, 38.

- Create B+ tree for the above-mentioned data items with constraints that order *p* of four and *pleaf* with three.
- Create B tree with order *p* of four

Q4 Determine whether the given schedules are serializable schedule or not 8 Marks

- R1(Y); R3(Y); W1(Y); R2(Y); W3(Y)
- R1(Z); R3(Z); W3(Z); W1(Z); R2(Z)
- R3(Y); R2(Y); W3(Y); R1(Y); W1(Y)
- R3(Z); R2(Z); R1(Z); W3(Z); W1(Z)

Find out equivalent serial schedules for the above-mentioned schedules.

Q5 Categorize the following schedules into hardest condition of recoverability. 8 Marks

- R1(P); R2(T); R1(T); R3(P); R3(Q); W1(P); C1; W3(Q); C3; R2(Q); W2(T); W2(Q); C2
- R1(P); R2(T); R1(T); R3(P); R3(Q); W1(P); W3(Q); R2(Q); W2(T); W2(Q); C1;C2;C3
- R1(P); R2(T); R3(P); R1(T); R2(Q); R3(Q); W1(P); C1; W2(T); W3(Q); W2(Q); C3; C2

Q6 Explain with examples the replication and allocation techniques in Distributed Database Management Systems. Prove that the wait-die and wound-wait protocols avoid deadlock and starvation. 10 Marks