VI SEMESTER B.TECH. (COMPUTER SCIENCE AND ENGINEERING) END SEMESTER MAKEUP EXAMINATIONS, JUNE 2023 SUBJECT: PRINCIPLES OF DATABASE SYSTEMS [CSE 4304]

REVISED CREDIT SYSTEM

Time: 3 HOURS

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.

Type: DES

Q1. Discuss any five benefits of using database over file systems for Food Delivery application. (5)

Q2. Write the SQL statements to create tables with primary key and foreign key constraints for the relational database given below:

- employees (emp_id, emp_name, dept_id, hire_date)
- departments (dept_id, dept_name)
- salaries (emp_id, salary)

Assume appropriate datatypes. (3)

Q3. Describe logical level of abstraction taking employees table of company database as the example. (2)

Q4. Construct an E-R diagram for Manipal Recording Studio with the following list of requirements. Identify the entities and relationships. Also mention the cardinality ratio and participation.

- Each musician that records at Manipal Studio has an SSN, a name, an address, and a phone number.
- Each instrument used in songs recorded at Manipal Studio has a unique identification number, a name (e.g., guitar, keyboard, flute) and a musical key (e.g., C, B-flat, E-flat).
- Each album recorded on the Manipal label has a unique identification number, a title, a copyright date and a format (e.g., CD or DVD)
- Each song recorded at Manipal has a title and an author.
- Each musician may play several instruments, and a given instrument may be played by several musicians.
- Each album has a number of songs on it, but no song may appear on more than one album. If an album is deleted, you should not keep track of its songs any longer. Song title identifies a song uniquely within an album.
- Each song is performed by one or more musicians, and a musician may perform a number of songs.
- Each album has exactly one musician who acts as its producer. A musician may produce several albums. (5)

Q5. Illustrate the concept of candidate key and superkey in courses table of university database. (3)

Q6. Discuss left outer join between student and department tables of university database. (2)

Q7. Construct an E-R diagram for National Hockey League (NHL) with the following list of requirements. Identify the entities and relationships. Also mention the cardinality ratio and participation.

- The NHL has many teams
- Each team has a name, a city, a coach, a captain, and a set of players,
- Each player belongs to only one team
- Each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records
- A team captain is also a player
- A game is played between two teams (referred to as host_team and guest_team) and has a date (such as May 11th, 2023) and a score (such as 4 to 2). (5)

Q8. For the given flight database write the SQL queries

Aircraft (aid, aname, range)

Certified (eid, aid)

Employees (eid, ename, salary)

By definition, pilots are those employees who are certified on atleast one aircraft.

- a) Find Ids of employees having salary greater than 50000.
- b) Find eid's of pilots who are certified on some 'Boeing' aircraft.
- c) Find names of pilots who can operate planes with a range greater than 3,000 miles but are not certified on Boeing. (3)

Q9. Consider the relational database given below:

- employees (emp_id, emp_name, dept_id, hire_date)
- departments (dept_id, dept_name)
- salaries (emp_id, salary)

Write SQL query to select the average salary for each department. (2)

Q10. Consider the relational database given below:

- employees (emp_id, emp_name, dept_id, hire_date)
- departments (dept_id, dept_name)
- salaries (emp_id, salary)

Write the SQL queries for:

- a) Find employees with highest salary
- b) Find the departments with highest number of employees (4)

Q11. Consider a schema R = (ABCDE) and a set of functional dependencies F = { $B \rightarrow AC$, $D \rightarrow C$, $C \rightarrow B$ }. Identify the attribute closure of D. (3)

Q12. Analyse if the schema R = (ABCD) is in BCNF with respect to set of functional dependencies F= $\{A \rightarrow BC, B \rightarrow A, C \rightarrow BD\}$. (3)

Q13. Write the canonical cover for a given set of functional dependencies $F = \{A \rightarrow B, A \rightarrow C, A \rightarrow D, B \rightarrow C, C \rightarrow D\}$ (5)

Q14. Consider a schema R = (ABCDE) and a set of functional dependencies F={B \rightarrow CD, A \rightarrow D, C \rightarrow A}. Identify all the candidate keys of R. (3)

Q15. Illustrate trivial functional dependency in employees table of company database. (2)