NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR
Department of Computer Applications
END SEMESTER EXAMINATION DECEMBER -2021

MCA 3rd Semester **Course Code:** CA3301
Course Name: Database Management Systems
Time: 03 Hour **Max. Marks:** 50

Note: The question paper consists of 05 questions. Attempt all questions . All questions are carrying 10 marks each. Assume any suitable missing data . If any.

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1 i) Suppose you are given the following requirements for a simple database for the National Hockey League (NHL) and construct a clean and concise ER diagram for the NHL database.

- 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, 1999) and a score (such as 4 to 2).

ii) How to ensure the integrity with key constraints in database systems? Explain with primary and foreign key constraints. **6+4**

2.i) Consider the following relational database schema and answer the following questions using relational algebra queries. **4*2 + 2**

Sailors(sid: integer, sname: string, rating: integer, age: real)

Boat(bid: integer, bname: string, color: string)

Reserves(sid: integer, bid: integer, day: date)

a. Find the names of sailors who have reserved a red or a green boat.

b. Find the average age of sailor with rating of 10.

c. Find the number of reservations for each red boat.

d. Find the name and age of oldest sailor.

ii) State the difference between Cartesian product with Join operation in relational algebra.

3. i) What are the reasons of normalizing any table ?
   ii) What is lossless decomposition . Explain with the help of example.
   iii) Define soundness and correctness properties of Armstrong's Axioms. **3+3+4**

4. Let R(A,B,C,D) be a relational schema in which the following FDs are known to hold: **3+3+4**

A->B

B->C

C->BD

i) Calculate F^+ of the above schema.
ii) Calculate Candidate key of the above schema.
iii) In which normal form the above schema is? Give justification in every step.

5. i) With the help of state transition diagram explain the states of transaction execution.
   ii) Describe the various steps in Query Processing, explain why each is necessary. **6+4**