Course Code : CDT 208 **QVRU/RS – 22 / 1169**

Fourth Semester B. Tech. (Computer Science and Engineering / Data Science) Examination

DATABASE MANAGEMENT SYSTEMS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry marks as indicated against them.
(2) Give suitable examples.
(3) Draw neat and clean diagram wherever necessary.

1. (a) Compare DBMS and early file systems bringing out the major advantages of the database approach. 4 (CO 1)

   (b) Give the short answers of the following :—

   - Define referential integrity constraint along with example.
   - List Two disadvantages of DBMS Systems.
   - List Two characteristics of Primary Key. 6 (CO 1)

2. (a) Given the following relations from literary database :—

   Authors (author_id, first_name, last_name, country, birth_year)

   Books (title, author_id, publication_year)

   Nobel_Winners (author_id, award_year)

   Write the SQL queries to compute the following :—

   - List the first name of Nobel prize winner from India.
   - List the title of books by authors from Japan or Netherlands.
   - List the title of books by Noble prize winner that were published after 1990.

- List the last name of authors who have published the book in 2010 and received the Nobel Prize after 2020.
- Change the country of the author from 'US' to 'India' for the book titled 'DBMS'.
- Differentiate between Truncate and Delete statements. 6 (CO 1)

(b) Define and give one example for the following mapping cardinalities :—

- One to One.
- One to Many.
- Many to One.
- Many to Many. 4 (CO 1)

3. (a) Consider the following set F of functional dependencies for the following relation R = (ABCD) :—

$F = \{A \rightarrow BD,\ C \rightarrow D,\ B \rightarrow D\}$

- Compute the closure of F.
- Compute A^+ [Closure of A].
- Determine the candidate key(s) of R.
- Prove that R is not in BCNF.
- Suitably decompose R into appropriate relation such that all of the relations are in BCNF.
- Is the obtained decomposition is dependency preserving ? Briefly justify Yes or No. 6 (CO 2)

(b) Explain insertion, deletion and modification anomalies. Why are they considered bad ? Illustrate with example. 4 (CO 2)

4. (a) Give the difference between Primary index and Secondary index. 4 (CO 3)

(b) What causes bucket overflow in hash file organization ? What can be done to reduce the occurrence of bucket overflow ? 3 (CO 3)

(c) Suppose that we are using extendable hashing on a file that contains records with the following search key values :

(2, 3, 5, 7, 11, 17, 19, 23, 29, 31)

Show the extendable hash structure for the file if the hash function $h(x) = x \bmod 8$ and bucket can hold three records. 3 (CO 3)

5. (a) Explain the various steps involved in query processing with proper diagram and example. 6 (CO 3)

(b) A relation R and S has 20000 and 16000 records respectively. It is estimated that 40 records of R and 50 records of S can fit in a single block. Estimate the number of block transfers for R NJN S using :

- Block Nested Loop Join.
- Sort - Merge Join [Let M = 3]. 4 (CO 3)

6. (a) Discuss two phase locking protocol. How does it guarantee serialization ? Also point out the difference between strict and rigorous 2 phase locking protocol. 5 (CO 4)

(b) Bring out the difference between conflict and view sriazability.

Schedules S1 and S2 are given below.

State whether each schedule is serializable or not.

If a schedule is serializable, write down the equivalent serial schedule(s).

Identify and list all conflicts prior to constructing the serializability graph(s).

S1 : r1(X); w2(X); r3(X); r1(Y); r4(Z); w2(Y); r1(V); w3(V); r4(V); w4(Y); w5(Y); w5(Z);

S2 : r2(Y); w2(Y); r3(Y); w4(Z); r1(X); w1(X); w3(Y); r4(X); r1(Y); w1(Y); w2(X).

5 (CO 4)