



DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
SECOND SESSIONAL
SUBJECT: (CE317) DATABASE MANAGEMENT SYSTEM

Examination : B.Tech Semester - III
Date : 05/09/2023
Time : 11:00 a.m. to 12:15 p.m.
Seat No. :
Day : Tuesday
Max. Marks : 36

INSTRUCTIONS:

1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1 Do as directed.

- CO1 A (a) Consider a relation R (A, B, C, D, E) with the FDs $\{AB \rightarrow C, BC \rightarrow D, C \rightarrow E\}$. The number of super keys in the relation R is _____. [12]
- CO2 N (b) State true or false and Justify: Given that the [2]
• R is in 3NF
• R has the unique candidate key
• The candidate key can be simple/composite
then without checking for each FDs, it can be concluded that R is in BCNF as well.
- CO2 C (c) Answer the following query using Relational Algebra. [2]
Find the ID and name of each instructor in a department located in the building "Watson".
instructor(ID, name, dept_name, salary)
classroom(building, room_number, capacity)
department(dept_name, building, budget)
- CO4 R (d) State true or false and justify: If the schedule S is Cascadeless then S is [2]
also recoverable. **Note:** If your answer is true then justify, else give the counter example.
- CO4 N (e) Consider the following transactions with data items P and Q initialized to zero. Any non-serial interleaving of T1 and T2 for concurrent execution leads to _____. [2]
Choose from the following and justify:
1. A schedule that is not Conflict Serializable
2. A schedule that is Conflict Serializable
- | | |
|--|---|
| T1 : read (P) ;
read (Q) ;
if P = 0 then Q := Q + 1 ;
write (Q). | T2 : read (Q) ;
read (P)
if Q = 0 then P := P + 1 ;
write (P) |
|--|---|
- CO4 E (f) If the schedule S has 4 transactions each with x,y,z,w number of [2]
operations respectively, then answer the following questions:
(i) Total Number of schedules
(ii) Total Number of Serial schedules
(iii) Total Number of Concurrent(Non-Serial) Schedules

Q.2 Attempt Any TWO from the following questions.

- CO2 U (a) Decompose relation R till 2 NF. Consider R(A,B,C,D,E,F,G,H,I,J) with [12]
the following FDs : $\{AB \rightarrow C, BD \rightarrow EF, AD \rightarrow GH, A \rightarrow I, H \rightarrow J\}$. [6]
- CO1 A (b) i. What is a good decomposition? Is R a good decomposition? [4]
Explain. Consider R(X,Y,Z,U,V,W) with the following FDs:
 $\{Y \rightarrow U, V \rightarrow W, U \rightarrow V, U \rightarrow Y, W \rightarrow YU\}$
- ii. What is the candidate key for R(E,F,G,H,I,J,K,L,M,N) with the [2]
FDs $\{EF \rightarrow G, F \rightarrow IJ, EH \rightarrow KL, K \rightarrow M, L \rightarrow N\}$?

- CO2 E (c) There is a relation employee (eid, location, department, position, doj) with FDs {eid department → location position doj, location → department} and tuples as shown in Table I. What is the highest normal form for the employee? Is it perfect? Justify. If not then decompose further to make it perfect. [6]

Table I

eid	location	department	position	Doj
E101	L2	HR	P3	22-Sep-2021
E101	L6	IT	P7	11-Nov-2014
E102	L2	HR	P3	03-Mar-2016
E105	L7	IT	P6	22-Sep-2021
E103	L2	HR	P7	11-Nov-2014
E104	L6	IT	P4	01-Apr-2018

Q.3 Attempt the following questions.

- CO5 N (a) Consider the following four schedules due to three transactions (indicated by the subscript) using read and write on a data item x, denoted by r(x) and w(x) respectively. Which of them is/are conflict serializable? [12]
[6]
S1: r1(x); r2(x); w1(x); r3(x); w2(x)
S2: r2(x); r1(x); w2(x); r3(x); w1(x)
S3: r3(x); r2(x); r1(x); w2(x); w1(x)
S4: r2(x); w2(x); r3(x); r1(x); w1(x)
Also find the serial schedule(s) to which the given non-serial schedules is/are conflict serializable, if it passes the conflict serializability test.

- CO3 N (b) Consider a database of fixed-length records, stored as an ordered file. The database has 25,000 records, with each record being 100 bytes, of which the primary key occupies 15 bytes. The data file is block-aligned such that each data record is fully contained within a block. The database is indexed by a primary index file, which is also stored as a block-aligned ordered file. Suppose the block size of the file system is 1024 bytes, and a pointer to a block occupies 5 bytes. The system uses binary search on the index file to search for a record with a given key. You may assume that a binary search on an index file of b blocks takes $\text{ceil}(\log_2 b)$ block accesses in the worst case. Given a key, What are the numbers of block accesses required to identify the block in the data file that may contain a record with the key, in the worst case? [6]

OR

Q.3 Attempt the following questions.

- CO5 N (a) Test whether the following schedule is conflict serializable or not. [12]
Also test whether the following schedule is recoverable or not. [6]
S = r2(X), w3(X), t3c, w1(X), t1c, w2(Y), r2(Z), t2c, r4(X), r4(Y), t4c
Here, ri, wi, and tic denote read, write and commit operations respectively in transaction i. X, Y, and Z are data items. Also find the serial schedule(s) to which the given non-serial schedule is conflict serializable, if it passes the conflict serializability test.

- CO3 N (b) Suppose that we have an ordered file of 25,000 records and these records are stored on a disk and block size is 1024 bytes. Data file records are of fixed length and unspanned of size 100 bytes and suppose that we have created a primary index on a key field of size 9 bytes and a block pointer of size 6 bytes then find the average number of block access required with and without indexing. [6]