

INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR
B. Tech.(IT) 5th Semester Final Examination, 2021

Database Management System (IT-3103)

Full marks: 50

Time: 1 Hour and 30 Minutes

Answer any FIVE questions

1.

What is data dictionary? Explain the difference between database schema and database state. Consider a two dimensional array of size $m \times n$ that is used in C programming language. Using the array as an example, illustrate the difference between three levels of data abstraction.

2+3+5

2.

What is the need of role name in E-R diagram? With an example explain the concept of aggregation. Why are duplicate tuples not considered in a relation?

3+5+2

3.

Consider the following relations for a company database:

Employee (eno, ename, age, city, salary)

Works (eno, dno, hr)

Dept (dno, budget, city, manager_eno)

Write the queries in relational algebra.

a) Find the names of employees who work for both the department d1 and d2.

Write the queries in SQL.

b) Find the names of managers whose salary exceeds the average salary of their respective department.

Write the query in tuple relational calculus.

c) Find names of managers who manage departments with budget larger than Rs. 50000.

3+4+3

4.

Why are spurious tuples not considered? May we solve this problem? Consider a relation with partial dependency between primary key and other attributes of the relation. What are the problems associated with this relation? Prove that any relation with two attributes is in BCNF.

4+3+3

5.

Consider the following transaction:

T1:
read(X);
X=X+10;
write(X);

T2:
read(X);

Is there a concurrent execution of T1 and T2 which produces serializability of schedule. If yes show the schedule. Give an example of a serializable schedule that is not strict and state the reason. How does two-phase locking decrease the degree of multiprogramming?

3+4+3

6.

Consider the following S schedule of three transactions T₁, T₂, T₃.

S : r₁(A), r₂(B), w₁(C), r₃(B), r₃(C), w₂(B), w₃(C)

Timestamp of the transactions depend on the order of their execution. Apply timestamp ordering protocol for this schedule. Show the read and write timestamp value on different database items. Why is recovery using deferred update start from the end of the log? What are the disadvantages of deferred update recovery technique?

5+2+3

7.

What is clustering index? What are the advantages and disadvantages of a multilevel index? Consider a disk with block size 512 bytes. A record pointer is 7 bytes long. A file has 30000 EMPLOYEE records of fixed size and length of each record is 100 bytes. Suppose the file is not ordered by the key field eno (8 bytes) and we have constructed a multilevel index on eno. Find out the number of levels needed if we make it into a multilevel index.

2+3+5

8.

What is the need of validation phase in query processing? Find the value of selection cardinality for key and non-key attribute. Consider the join operation: EMP *_{dno=dnum} DEPT. EMP file has 10000 records stored in 2000 blocks. DEPT file consists of 125 records stored in 13 blocks. Primary key of DEPT is dnum. Which file is considered as outer loop for nested-loop (block oriented) join operation? If there are 7 main memory blocks, then how will it affect the result?

3+2+5