Department of Computer Science and Engineering
Motilal Nehru National Institute of Technology, Allahabad
MCA III-Sem, End-Sem Exam, December-2018
DBMS (CS 33102)

M.M. 60

Time: Three hours

Note: All questions are compulsory. Assume any missing data and write it at the top of your answer.

Ques 1 Draw an ER diagram that captures the following information. A company database needs to store information about employees (identified by ssn, with salary and phone as attributes), departments (identified by dno, with dname and budget as attributes), and children of employees (with name and age as attributes). Employees work in departments; each department is managed by an employee; a child must be identified uniquely by name when the parent (who is an employee; assume that only one parent works for the company) is known. We are not interested in information about a child once the parent leaves the company? **5**

Ques 2 Consider the following schema: **5*4**
Suppliers(sid, sname, city)
Parts(pid, pname, color)
Catalog(sid, pid, cost)
Write the following queries in Relational Algebra and SQL?

(a) Find the name of suppliers who supply red part.
(b) Find the sids of suppliers who supply red or green part.
(c) Find the sids of suppliers who supply red part or are at Kolkata.
(d) Find pairs of sids such that the supplier with the first sid charges more for some part than the supplier with the second sid.
(e) Find the pids of parts supplied by at least two different suppliers.

Ques 3 In the B+ tree ordered indexing technique, what will be B+ tree for the set of key values: (2, 3, 5, 7, 11, 17, 19, 23, 29, 31). Assume that the tree is initially empty and values are added in ascending order. The number of pointers that will fit in one node are six. **5**

Ques 4 (a) Consider the relational schema: **5+5**
Book (Title, Author, Catalog_no, Publisher, Year, Price)
having following functional dependencies:
I. Title, Author --> Catalog_no
II. Catalog_no --> Title, Author, Publisher, Year
III. Publisher, Title, Year --> Price

What is the Normal Form of the Book relation? Also find its candidate keys and super keys?

(b) Explain with example; dependency preservation and lossless decomposition?

5+5

Ques 5 Consider the following transactions:

T1:
Read(A);
Read(B);
If A=0 then B:=B+1;
Write(B);

T2:
Read(B);
Read(A);
If B=0 then A:=A+1;
Write(A);

The consistency requirement is A=0 or B=0. Take initial values at A=B=0.

(a) Show a concurrent execution of T1 and T2 that produces a non-serializable schedule?

(b) Add lock and unlock instructions to transactions to T1 and T2, so that they observe the two-phase locking protocol?

5+5

Ques 6 **(a)** Draw and explain Database System Architecture?

(b) Explain structured types and inheritance in SQL?