Bachelor Of Engineering In Information Technology

2nd Year 1st Semester, Supplementary Examination, 2023

Time : Three hours **Database Management Systems** **Full Marks=100**

CO1 [10]

Q1.

(a) Differentiate relation schema and relational instance?

(b) Describe the logical data independence and physical data independence.

(c) What is the advantage of DBMS over file processing system? [3+3+4=10]

CO2 [20]

Q2. (a)

Pet_Store				
Pet_ID	**Pet_Name**	**Category**	**Price**	**Breed**
1281	Tom	Dog	10,000	Beagle
1282	Jenny	Cat	5,000	Persian
1281	Tom	Dog	20,000	X
1282	Tom	Dog	15,000	Labrador
1281	Lucy	Bird	8,000	Macaw

Identify that the following two functional dependencies do hold or not on **Pet_Store.**

i) Pet_ID→Pet_Name

ii) Category→Pet_Name

(b) Consider the following relational schema: Airway(Flno, Flname, Source, Destination).

The following functional dependencies hold:

FD1: Flname → Source

FD2: Source → Flno

FD3: Source → Destination

Identify all candidate key(s) for the above relation.

What is the highest normal form of R?

(c) Define decomposition and how does it address redundancy? Discuss the problems that may be caused by the use of decompositions? [4+(4+4)+(4+4)=20]

CO3 [20]

Q3. (a) **Consider the following schema given below:**

Suppliers(sID, sName, address)

Parts(pID, pName, colour)

Catalog(sID, pID, price)

Write down the relational algebra expression equivalent to the following statement given below.

i) Find the sIDs of all suppliers who supply a part that is red or green.

ii) Find the names of all red parts.

(b) **Write SQL query** for following table **stud(rollno,name,sub1,sub2,sub3)**

i) Display name of student who got **minimum marks in sub1**.

ii) Find **total marks of sub1** of all student.

(c) Illustrate different set of operations in relational algebra with an example. [(3+3)+(3+3)+8=20]

CO4 [20]

Q4.

(a) Write in detail about the **Hash based Indexing and Tree based Indexing**?

(b) Explain about **B+ tree index file**?

(c) Let us consider the following statistics for searching for a condition in a given relation.

Number of blocks containing record of the relation (b) = 500

Time to transfer one block (t_b) = 0.5 milliseconds

Time for one seek (t_s) = 4 milliseconds

Find out the cost of selection query on a key attribute using linear search file scan.

Or

Suppose a file is organized using a B+ tree of order 4. The search-keys are inserted in the following order: 1, 5, 10, 25, 30, 3, 8, 13, 27, 35, 15, 17, 19.
Draw the B+ tree and justify this statement "The Key 25 will be in root node". [8+6+6=20]

CO5 [20]

Q5. (a) Consider the following schedule S of Transactions T1,T2, T3 and T4. R(X) denotes read operation on data item X by transaction Ti. W(Y) denotes write operation on data item Y by transaction Ti.

T1	T2	T3
	R(X)	
R(Y)		
		R(Z)
		W(Z)
	W(Y)	
R(X)		

Justify the following for the above schedule S:
i) Is S conflict serializable or not?
ii) If the schedule is conflict serializable then how many conflict serializable schedule are possible for the above schedule.

(b) Consider the following example of a log of four transactions, where an immediate database modification scheme is used. If a crash occurs just after step 12 and the recovery of the system is successfully completed, which of the following transactions need to do redo and undo operations?

steps	Details of log
1	⟨T0 start⟩
2	⟨T0,A,100,200⟩
3	⟨T0,A,200,300⟩
4	⟨T0 commit⟩
5	⟨T1 start⟩
6	⟨T1,B,500,400⟩
7	⟨checkpoint{ T1} ⟩
8	⟨T2 start⟩
9	⟨T2,A,300,1500⟩
10	⟨T2 commit⟩
11	⟨T3 start⟩
12	⟨T3,C,1000,2000⟩

(c) Discuss about the recoverable schedules? [(5+5)+5+5=20]

CO6 [10]

Q6.
(a) Define **Decentralized Database and Data Warehouse.**
(b) Write down the 5V's (characteristics) of big data. [5+5=10]

After completing this course, the students should be able to:

CO1: Explain the basic Database concepts and different data models. (K2)

CO2: Find the available functional dependencies to apply normalization concepts in typical scenarios. (K3)

CO3: Design queries using relational algebra operations and SQL. (K3)

CO4: Explain principles of Physical Data Storage and Query Optimization. (K3)

CO5: Comprehend transaction processing and concurrency control techniques and apply them in various problems (K3)

CO6: Discuss different types of advanced databases. (K2)