CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

4th Semester of B. Tech (CE) Examination

May 2018

CE246 Database Management System

Date: 02.05.2018, Wednesday **Time: 10.00 a.m. To 01.00 p.m.** **Maximum Marks: 70**

Instructions:

1. The question paper comprises two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1 **Answer the questions below:**

(a) Define the following terms: **[04]**
(i) Database Schema (ii) View (iii) DBA (iv) Deadlock

(b) What is Database Management System? How does it differ from Traditional File System? **[03]**

Q – 2 **Answer the questions below:**

(a) Explain a Database System three level architecture with a block diagram. **[04]**

(b) **Answer the questions below (Any Two)**

(i) What is the need of Key in Database? Differentiate Super Key, Candidate Key, Primary Key and Foreign Key with example. **[05]**

(ii) 1) Explain specialization and generalization feature of E-R diagram with example. **[03]**
2) Differentiate between Tuple Relational Calculus & Domain Relational Calculus. **[02]**

(iii) Consider the Following Relational schema: **[05]**
Actor(actor_ID, a_name, nationality, age)
Film(film_ID, title, year, director_ID)
Performance(actor_ID, film_ID, character)
Director(director_ID, d_name, nationality)
Construct relational algebra queries for the following statements:
1. Retrieve the names of all British directors.
2. Find out the names of all American actors above the age of 40.
3. Retrieve the name of each actor together with the titles of the films he/she has performed in.
4. Retrieve details of all films that were released in 2017.
5. Find out the names of all actors that have played the character of Tom Cruise.

Q - 3 **Answer the questions below:**

(a) How GROUP BY clause works? What is the difference between WHERE and HAVING? **[03]**

(b) A Relation R has four attribute ABCD. For each of the following sets of FD, do the following: **[06]**
(i) Identify the candidate key(s) for R.
(ii) Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF).
(iii) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.

1. C→D, C→A, B→C 2. A →B, BC→ D, A →C

(c) Consider a University Database for the scheduling of classrooms for final exams. This Database could be modeled as the single entity set exam, with attributes course_name, section_no, room_no and time. Alternatively, one or more additional entity sets could be defined, along with relationship sets to replace some of the attributes of the exam entity set as: **[05]**

1. Course with attributes name, dept and course_no.
2. Section with attributes s_no and enrollement, and dependent as a weak entity set on course.
3. Room with attributes r_no, capacity and building.

Draw and E-R diagram illustrating the use of all three additional entity sets listed.

OR

Q – 3 Answer the questions below:

(a) What is Functional Dependency? Find the Minimal Cover or Irreducible set from the following functional dependencies given; {A → BC, B → C, AB → D} **[04]**

(b) Construct an E-R diagram for school management system. **[05]**

(c) (i) Consider a Relation R with five attributes ABCDE. You are given the following dependencies: A → B, BC →E and ED → A. **[03]**

1. List all keys for R. 2. Is R in 3NF? 3. Is R in BCNF?

(ii) What are Database Constraints in DBMS? Explain any two constraints with example. **[02]**

SECTION – II

Q - 4 Answer the questions below:

(a) How Locking is useful in Database System? Explain 2-Phase Locking Protocol. **[03]**

(b) Write short notes on the following

(i) ACID properties of transaction in brief. **[02]**

(ii) Name the 5 states of a transaction? Draw Diagram. **[02]**

Q -5 Answer the questions below:

(a) Given is the following schedule over transactions T_1, T_2, T_3:

T1	T2	T3
	read(Z)	
	read(Y)	
	write(Y)	
		read(Y)
		read(Z)
read(X)		
write(X)		
		write(Y)
		write(Z)
	read(X)	
read(Y)		
write(Y)		
	write(X)	

(i) Is this schedule Conflict Serializable? Explain why or why not. **[02]**

(ii) Assuming the timestamp order $TS(T_1) < TS(T_2) < TS(T_3)$: Is the schedule in (i) possible under the timestamp ordering protocol? Explain your answer. **[02]**

(iii) What is meant by the concurrent execution of database transactions in a multiuser system? Discuss why concurrency control is needed, and give informal examples. **[03]**

(b) (i) Explain Hadoop Ecosystem with the help of neat diagram. **[05]**

(ii) Compare and contrast NoSQL vs. Relational Databases. **[02]**

OR

Q -5 Answer the questions below:

(a) Construct a B+-tree for the following set of values
(2, 3, 5, 7, 11, 17, 19, 23, 29, 31)
Assume that the tree is initially empty and values are inserted in ascending order.

(i) Construct B+-trees for the cases where the number *m* of pointers that will fit a node is as follows: **[04]**
1. Four (*m*=4)
2. Seven (*m*=7)

(ii) Shows the form of the B+-tree after each operation of the sequence: **[03]**
Insert 9; Insert 10; Insert 8; Insert 6; Insert 1; Insert 4 for the case *m*=4.

(b) (i) What Data as of Big Data? Discuss challenges under Big Data. How Big Data can be useful in the development of smart cities.(Discuss one application) **[05]**

(ii) Explain the role of JobTracker & Name Node in HDFS architecture. **[02]**

Q – 6 Answer the questions below (Any two)

(a) Consider the following relation r:

	Course	StudID	Grade
r0	DMS	2100	18
r1	ITP	2157	18
r2	ITP	2230	30
r3	DMS	2177	24
r4	OS	2340	30
r5	ITP	2200	23
r6	DMS	2157	28
r7	DB	2300	30
r8	DMS	2363	25
r9	DB	2299	28

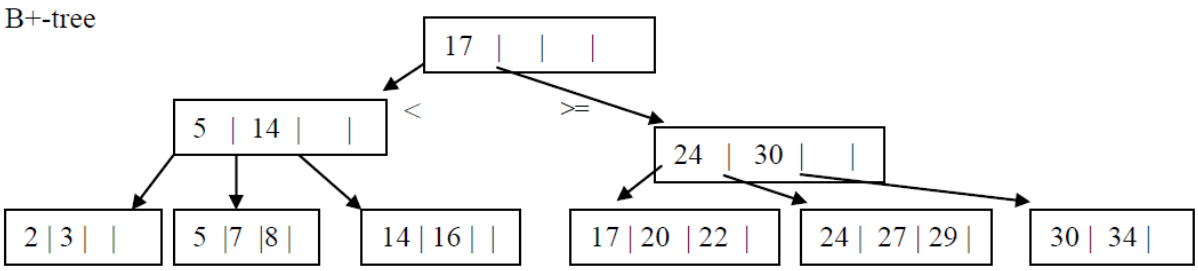
Give an answer of following questions

(i) A hash file organization using extendable hashing on **Grade** and the hash function h (n) = n mod 8. Each bucket holds at most 2 tuples. Show the structure after inserting r0 − r4 and after inserting all the tuples r0 - r9. **[04]**

(ii) Explain BitMap. Design a bitmap index of Course and Grade. **[03]**

(b) For the following B+-tree (m = 5) show the form of the tree after each of the of operations of the sequence:

(i) Delete 17, Delete 20, Delete 34 **[03]**



(ii) Explain Dense & Sparse Index with example. **[04]**

(c) (i) Consider the following three linked tables that contain information about employees and the projects they work on: **[03]**

employees (empID, name, salary)

project (projNbr, title, budget)

workload (empID, projNbr, duration)

Consider the following query:

SELECT P.title, E.name FROM employees E, project P, workload W

WHERE E.empID = W.empID

AND P.projNbr = W.projNbr AND E.salary > 15000 AND W.duration < 20;

Draw an optimize relational algebra tree for the above query.

(ii) Explain about Transaction Processing Monitors and its Interface Standards in detail. **[04]**