VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

D2

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
Fall Semester 2018-19

CAT-II

Course Name	: Database Management Systems	**Duration**	: 90 Minutes
Course Code	: CSE2004	**Max. Marks**	: 50

Answer All the Questions (5 * 10 = 50 Marks)

1. Consider the given following set of functional dependencies for a relation R(A,B,C,D,E,F), F={AB → C,DC→AE,E→F } (10)
   a) What are the keys of this relation?
   b) Is this relation in BCNF? If not, explain why by showing one violation.
   c) Is the decomposition (A, B, C, D) (B, C, D, E, F) a dependency preserving decomposition? If not, explicate.

2. A relation named EMP_DEPT with attributes: ENAME, SSN, BDATE, ADDRESS, DNUMBER, DNAME, and DMGRSSN. (10)
   Consider also the set G of functional dependencies for EMP_DEPT:
   G = {SSN → ENAME, BDATE, ADDRESS, DNUMBER
   DNUMBER→ DNAME, DMGRSSN}
   a) Calculate the closures SSN+ and DNAME+ with respect to G.
   b) Is the set of functional dependencies G minimal? If not, find a minimal set of functional dependencies that are equivalent to G.
   c) List an update anomaly, insertion anomaly, deletion anomaly that can occur for relation EMP_DEPT.

3. Consider the following relations: (10)
   Applicants (id, name, city, sid)
   Schools (sid, sname, srank)
   Major (id, major)
   Engrave SQL query to find all applicants who wants major in CSE, live in Seattle, and go to a school ranked less than 10.
   Draw the initial query tree and optimize the query tree using heuristic approach.

4. Inspect the following three schedules for three concurrent transactions T1, T2, T3: (10)
   S1 = {r2(c), r2(b), w2(b), r3(b), r3(d), r3(c), r1(a), w1(a), w3(b), w3(c), r2(a), r2(d), w2(d), r1(b), w1(b), w2(a)}

S2 = {r3(b), r3(c), r3(d), r1(a), w1(a), w3(b), w3(c), r2(c), r1(b), w1(b), r2(b), w2(b), r2(a), w2(a), r2(d), w2(d)}

S3 = {r1(a), w1(a), r2(c), r2(b), w2(b), r2(d), r2(a), w2(a), w2(d), r1(b), w2(b), r3(b), r3(c), w3(b), w3(c), r3(d)}

For each of the three interleaved schedules, determine if the schedule is serializable. If so, give an equivalent serial schedule.

5. Contemplate the Pubs Database Schema given below: (10)

Pubs Database Schema

author(author_id,first_name,last_name)

author_pub(author_id,pub_id,author_position)

book(book_id,book_title, month,year,editor)

pub(pub_id,title,book_id)

- primary keys are underlined
- author_id in author_pub is a foreign key referencing author
- pub_id in author_pub is a foreign key referencing pub
- book_id in pub is a foreign key referencing book
- editor in book is a foreign key referencing author(author_id)

Pubs Database State

r(author)

author_id	first_name	last_name
1	John	McCarthy
2	Dennis	Ritchie
3	Ken	Thompson
4	Claude	Shannon
5	Alan	Turing
6	Alonzo	Church
7	Perry	White
8	Moshe	Vardi
9	Roy	Batty

r(author_pub)

author_id	pub_id	author_position
1	1	1
2	2	1
3	2	2
4	3	1
5	4	1
5	5	1
6	6	1

r(book)

book_id	book_title	month	year	editor
1	CACM	April	1960	8
2	CACM	July	1974	8
3	BST	July	1948	2
4	LMS	November	1936	7
5	Mind	October	1950	NULL
6	AMS	Month	1941	NULL
7	AAAI	July	2012	9
8	NIPS	July	2012	9

r(pub)

pub_id	title	book_id
1	LISP	1
2	Unix	2
3	Info Theory	3
4	Turing Machines	4
5	Turing Test	5
6	Lambda Calculus	6

Engrave relational algebra expression for the following:

a) Find the names of all authors who are book editors
b) Find the names of all authors who have at least one publication in the database.
c) Find the authors authored a pub that was published in July
d) Count the number of books for each year.