

Reg. No.: 210CESS46

Name : SURY

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

Continuous Assessment Test-II – March 2023

Programme	: B.Tech CSE	Semester	: Win Sem(2022-23)
		Code	: BCSE302L
		Class Nbr(s)	: CH2022235000588 CH2022235000589 CH2022235000590 CH2022235000591 CH2022235000592 CH2022235000593
Course Title	: Database Systems		
Faculty (s)	: Dr. Janani T, Dr. Leninisha Shanmugam, Dr. Rishikeshan CA Dr. Tamilarasi K, Dr. Brindha Dr. Jaisakthi S M	Slot	: B2+TB2
Time	: 90 Mins	Max. Marks	: 50 marks

Answer all the Questions

1.	<p>Assume that you are creating a relation to store details related to a novel AT&T project. You have received the details from your client and still figuring out a way to understand various attributes involved. Your Client describes the characteristic of those attributes and you are defining the following functional dependencies of the relation ATT(A,B,C,D,E,H) as</p> <p>FD_ATT= {{A→BC},{CD→E},{E→C}, {D→AEH}, {ABH→BD}, {DH→BC}}.</p> <p>(i) Identify closure of each attribute and then identify Key attribute(s). (3 marks)</p> <p>(ii) List out prime and non-prime attributes. (2 marks)</p> <p>(iii) Find minimal cover. (5 marks)</p>	10																																			
2.	<table> <tr> <th>PET ID</th><th>PET NAME</th><th>PET TYPE</th><th>PET AGE</th><th>OWNER</th><th>VISIT DATE</th><th>PROCEDURE</th></tr> <tr> <td>246</td><td>Rover</td><td>Dog</td><td>12</td><td>Sam</td><td>Jan 13/2002 Mar 27/2002 Apr 02/2002</td><td>01 – Rabies Vaccination 10 – Examine & treatment 05 – Worm test</td></tr> <tr> <td>298</td><td>Morris</td><td>Dog</td><td>2</td><td>Kim</td><td>Jan 21/2003 Mar 10/2003</td><td>08 – Tetanus Vaccination 05 – Heart worm test</td></tr> <tr> <td>341</td><td>Tweedy</td><td>Cat</td><td>4</td><td>Terry</td><td>Jan 23/2003 Jan 13/2003</td><td>01 – Rabies Vaccination 01 – Rabies Vaccination</td></tr> <tr> <td>519</td><td>Jack</td><td>Bird</td><td>2</td><td>James</td><td>Apr 30/2003 May 25/2003</td><td>20 – Annual check up 12 – Eye wash</td></tr> </table> <p>Normalize the following HEALTH HISTORY REPORT of a pet clinic up to 4 the normal form considering the following functional dependencies.</p> <p>PET_ID → PET_NAME, PET TYPE, PET AGE</p>	PET ID	PET NAME	PET TYPE	PET AGE	OWNER	VISIT DATE	PROCEDURE	246	Rover	Dog	12	Sam	Jan 13/2002 Mar 27/2002 Apr 02/2002	01 – Rabies Vaccination 10 – Examine & treatment 05 – Worm test	298	Morris	Dog	2	Kim	Jan 21/2003 Mar 10/2003	08 – Tetanus Vaccination 05 – Heart worm test	341	Tweedy	Cat	4	Terry	Jan 23/2003 Jan 13/2003	01 – Rabies Vaccination 01 – Rabies Vaccination	519	Jack	Bird	2	James	Apr 30/2003 May 25/2003	20 – Annual check up 12 – Eye wash	10
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PET NAME → VISIT DATE, PROCEDURE
 VISIT DATE → PET NAME, OWNER
 OWNER → PET NAME, VISIT DATE, PROCEDURE

3. Consider the following Relation:

F_id	F_name	Designation	Salary
1005	Ravi	prof.	100000
1001	Usha	prof.	30000
1002	Pritto	prof.	300000
1003	Ramya	Asst. prof.	10000
1004	Raji	Asst. prof.	10000
1006	Smitha	Asso. prof.	80000

10

Construct the B+tree by inserting the above records in the same sequence. Delete the records which is having the values of as '1003' & '1005', and then, insert the record: (1007,'Bala',Prof,150000)

4. Consider the following MOVIE database schema:

ACTOR (Act_id, Act_Name, Act_Gender)
 DIRECTOR (Dir_id, Dir_Name, Dir_Phone)
 MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)
 MOVIE_CAST (Act_id, Mov_id, Role)
 RATING (Mov_id, Rev_Stars)

$\pi_{act_name}(\sigma_{count() = \max(count())}(MOVIE_CAST \times ACTOR))$

10

Write Relational Algebra queries to the following: [4 × 2.5 = 10 Marks]

- Find the actor name who has maximum number of movies. $\pi_{Act_Name}(\sigma_{count() = \max(count())}(MOVIE_CAST \times ACTOR))$
- List all actors who acted in movies released before 2005.
- Find the title of movies acted by 'Surya' released after 2018 with rating above four.
- Update the rating of all 2022 movies of director 'S. S. Rajamouli' to rating value 5.

5. The hash key field and corresponding binary hash value is given in the below table. Use Extendible hashing scheme to store the given key field in a table. Each bucket can hold up to 2 records. The hash value is used in the order least significant bit to most significant bit while performing hashing. Present the hashing results stepwise after inserting each key and explain the same in detail.

Key	Hash Value
122a	0001
122b	0010
122c	0011
171	0100
222	0101
223	0110
241	0111
274	1000
290	1001
299	1010

MOVIES ← MOVIES 10x
 $\sigma_{Dir_}$

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Programme	: B.Tech CSE	Semester	: Win Sem(2022-23)
Course Title	: Database Systems	Code	: BCSE302L
		Class	: CH2022235000582
		Nbr(s)	CH2022235000583
			CH2022235000584
			CH2022235000585
Faculty (s)	: Dr. Janani T, Dr. Leninisha Shanmugam Dr. Rishikeshan CA, Dr. Tamilarasi K Dr. Brindha, Dr. Jaisakthi S M	Slot	: B1+TB1
Time	: 90 Mins	Max. Marks	: 50 marks

Answer all the Questions

1. ☒ Find the minimal cover of the set of Functional Dependencies. (5Marks)

Given: $R = \{A, B, C, D, E, H\}$, $F: \{A \rightarrow BC, B \rightarrow CE, A \rightarrow E, AC \rightarrow H, D \rightarrow B\}$

- (10) ☒ Suppose a relational schema $R(A, B, C, D, E, F, G, H)$ and a set of Functional Dependency as followings. List all candidate keys of R . (5Marks)

$CH \rightarrow G$,
 $A \rightarrow BC$
 $B \rightarrow CFH$
 $E \rightarrow A$
 $F \rightarrow EG$.

10

2. ☒ An Industry wants to maintain a database to keep track of Employees (PermanentEmployees, ContractEmployees) their children and their cars. For this purpose, initially in the relation:

EmpData(Eid, EName, EAddress, cNbr, cName, cAddress, aLic, aMake)

Eid	EName	EAddress	cNbr	cName	cAddress	aLic	aMake
111	Nils	Adayar	333	Eva	Adayar	ABC123	Toyota
222	Anna	Adayar	333	Eva	Adayar	ABC123	Toyota
111	Nils	Adayar	444	Johan	Adayar	ABC123	Toyota
222	Anna	Adayar	444	Johan	Adayar	ABC123	Toyota
111	Nils	Adayar	333	Eva	Adayar	DEF456	Ford
222	Anna	Adayar	333	Eva	Adayar	DEF456	Ford
111	Nils	Adayar	444	Johan	Adayar	DEF456	Ford
222	Anna	Adayar	444	Johan	Adayar	DEF456	Ford

10

Eid, EName, EAddress is the employee number, name and address of a employee. cNbr, cName, cAddress is the corresponding information for a child. Each employee has exactly one address. aLic, aMake is the license number and make of a car. A car may be owned by more than one employee. The functional dependencies hold by the relation as follows

- FD1. Eid \rightarrow EName, EAddress
 FD2. cNbr \rightarrow cName, cAddress
 FD3. aLic \rightarrow aMake

- ✓ a) Is this relation in BCNF? Justify. If not, decompose it into relations that are in BCNF. (6marks)
 b) If the decomposed relations violates 4NF and then normalize it to make it satisfy the 4NF. (4marks)

3. Construct a B+ Tree by performing the below operations and give explanation at each step. Order of a node is three.

- (5+4) a) Insert the key values in the order (sun, fleet, bus, lindt, tent) and show the resulting B+ Tree. (3 marks)
 b) After performing the above operation, delete the keys lindt, fleet in the given order and show the resulting B+ tree. (4 marks)
 c) After performing the above operations, insert the keys in order (cane, pen, van) and show the resulting B+ tree (3 marks)

4. Considering the following relations, write a relational algebra expression followed by SQL query.

(5+3) Flights (Flight Number, from, to, distance, departure_time, arrival_time, price)
 Aircraft (aircraft_id, aircraft_name, cruising_range)
 Certified (employee_id, aircraft_id)
 Employees (employee_id, employee_name, salary)

Note: Employees relation describes pilots and other employees also. Every pilot is certified for some aircraft and only pilots are certified to fly.

- ✓ a) Display the employees name of pilots who can operate planes with cruising range greater than 30000 miles but are nor certified on any Boeing. (5Marks)
 ✓ b) For all aircrafts with cruising range over 1000 miles find the name of aircraft and the average salary of all pilots certified for this aircraft. (5Marks)

5. Consider the following relations of a university database.

Faculty (**EmpId**, Name, Phno, School, DateOfJoining)
 Student (**RegNo**, Name, Phno, School)
 Course (**CourseCode**, CourseName, Credits)
 CourseAllocation (**ClassNumber**, AEmpId, ACourseCode, Venue, MaxStrength, Slot)
 StudReg (**RegNo**, **ClassNumber**)

- (10) a) Provide an initial query tree to retrieve Name and Phone numbers of Faculty members who are handling DBMS (CourseName) and joined after 01-01-2023. (5Marks)
 ✓ b) Convert the constructed canonical tree to optimized tree using Heuristic technique. Explain each step with appropriate trees. (5Marks)