

Reg. No.: 21B131279

Name : Kanyan



VIT

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

Continuous Assessment Test (CAT-2) – March 2023

Programme	: B.Tech (CSE)	Semester	: Winter Semester 2022-23
Course Code	: BCSE302L	Slot	: E2+TE2
Course Title	: Database Systems		
Faculty(s)	: Dr. Appalaraju Muralidhar Dr. L.M. Jenila Livingston Dr. A. Balasundaram Dr. J. Uma Maheswari Dr. Abishi Chowdhury Dr. Rajesh M Dr. Manjula D	Class Nbr(s)	: CH2022235000916 CH2022235000919 CH2022235000920 CH2022235001197 CH2022235001198 CH2022235001262 CH2022235001264
Time	: One Hour and Thirty Minutes	Max. Marks	: 50

Answer ALL the Questions

1.	Consider the relation $R=\{P,Q,R,S,T\}$ and the given set of functional dependencies: FD: $\{P \rightarrow Q, R \rightarrow S, QR \rightarrow S, Q \rightarrow PRT, T \rightarrow R\}$. i. Find the minimal cover of FD. [6 marks] ii. List down the super keys and candidate keys of R. [4 marks]	[10]
2.	Given a relation R with eight attributes and four functional dependencies. Perform the Normalization process up to the Third Normal form. $R(\underline{Projno}, Projname, \underline{Emp_no}, Emp_name, Job_class, Charge_hrs, \underline{Hrs_billed}, Tot_charges)$ FD1 : $Projno \rightarrow Projname$ FD2 : $Emp_no \rightarrow Emp_name, Job_class$ FD3 : $Projno, Emp_no \rightarrow Hrs_billed, tot_charges$ FD4 : $Job_class \rightarrow Charge_hrs$	[10]
3.	a) Construct a B^+ tree of order 4 using the key values 24, 45, 11, 89, 55, 67, 49, 38, 7, 23, 12, 78, 97, 36, 21. Show the constructed B^+ tree. [7 marks] b) Delete the key values 38, 12, and 89 from the constructed B^+ tree [3 marks]	[10]

4.	<p>Consider the following relations concerning cricket players.</p> <p>Player (PlayerId, PlayerName, Country, Age, Runs, Wickets) IPL (PlayerId, TeamId, TeamName, MatchesPlayed) TestCricket (PlayerId, Year)</p> <p>Write Relational algebra expressions for the following queries:</p> <ol style="list-style-type: none"> Select all the attributes from Player relation for which the number of wickets is greater than or equal to 200. (1½ marks) List all the player ids, team ids, and matches played from IPL relation. (1½ marks) List the players' details, who have not played for IPL. (2 marks) Count the number of players who have played for both IPL and Test Cricket. (2 marks) List the player names along with their age, who have played for the IPL team 'CSK'. (2 marks) Rename the relation IPL to IPLCricket (1 mark) 	[10]
5.	<p>Given the following relations:</p> <p>Participants (pno, name, address, telephone, email); Categories (code, category_name, description); Winners (pno, code, year, award);</p> <p>The SQL query to retrieve all Silver medal winners with each winner's name, category, and year is given below: SELECT name, category_name, year FROM Participants p, Categories c, Winners w, WHERE p.pno=w.pno and c.code=w.code and award='SILVER'</p> <p>Perform the following:</p> <ol style="list-style-type: none"> Write the equivalent relation algebraic expression [2 marks] Draw a query tree for the above relational algebraic expression [2 marks] Apply heuristic optimization to optimize the query and draw the optimized query tree for the query.[6 marks] 	[10]

Reg. No.: 2 LBPS1364
Name : Mubin



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Continuous Assessment Test (CAT-2) – March 2023

Programme	: B.Tech (CSE)	Semester	: Winter Semester 2022-23
Course Code	: BCSE302L	Slot	: E2+TE2
Course Title	: Database Systems		
Faculty(s)	: Dr. Appalaraju Muralidhar Dr. L.M. Jenila Livingston Dr. A. Balasundaram Dr. J. Uma Maheswari Dr. Abishi Chowdhury Dr. Rajesh M Dr. Manjula D	Class Nbr(s)	: CH2022235000916 CH2022235000919 CH2022235000920 CH2022235001197 CH2022235001198 CH2022235001262 CH2022235001264
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Answer ALL the Questions

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2.	Given a relation R with eight attributes and four functional dependencies. Perform the Normalization process up to the Third Normal form. $R(\text{Projno}, \text{Projname}, \underline{\text{Emp_no}}, \text{Emp_name}, \text{Job_class}, \text{Charge_hrs}, \underline{\text{Hrs_billed}}, \text{Tot_charges})$ FD1 : $\text{Projno} \rightarrow \text{Projname}$ FD2 : $\text{Emp_no} \rightarrow \text{Emp_name}, \text{Job_class}$ FD3 : $\text{Projno}, \text{Emp_no} \rightarrow \text{Hrs_billed}, \text{tot_charges}$ FD4 : $\text{Job_class} \rightarrow \text{Charge_hrs}$	[10]
3.	a) Construct a B^+ tree of order 4 using the key values 24, 45, 11, 89, 55, 67, 49, 38, 7, 23, 12, 78, 97, 36, 21. Show the constructed B^+ tree. [7 marks] b) Delete the key values 38, 12, and 89 from the constructed B^+ tree [3 marks]	[10]

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Reg. No.:

Name :



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Continuous Assessment Test-II – March 2023

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. a) Find the minimal cover of the set of Functional Dependencies. (5Marks)
Given: $R = \{A, B, C, D, E, H\}$, $F: \{A \rightarrow BC, B \rightarrow CE, A \rightarrow E, AC \rightarrow H, D \rightarrow B\}$

- b) 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.

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

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.
- 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.

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)
- 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)