Reg. Number:	22BCE1073

VIT

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

Continuous Assessment Test (CAT) – II - October 2024

Programme	:	B.Tech (CSE)	Semester	:	Fall Semester 2024-2025
Course Code & Course Title	:	BCSE302L & Database Systems	Slot	:	D2+TD2
Faculty	:	Dr. Premalatha M Dr. Rishikeshan C A Dr. Ilakiyaselvan N	Class Number(s)	:	CH2024250101249 CH2024250101253 CH2024250101259
Duration	:	1 Hr 30 Mins	Max. Mark		50

Answer all questions

Q. No	Sub Sec	Description	Marks
1		Consider the following relation for online music streaming platform: SONG (Song_title, Artist_name, Genre, Release_year, Album_name, Record_label, Song_length, Streaming_platform, Country, Producer_name, Language, Awards_won, Downloads) Suppose the following dependencies exist: **FD1:** Song_title, Genre → Album_name, Record_label, Song_length, Producer_name (A specific song in a genre determines the album, record label, length, and producer.) **FD2:** Genre → Release_year (A specific genre is tied to a general release year.) **FD3:** Artist_name → Country (An artist is associated with a specific country of origin.) ***FD4:*** *Album_name → Record_label, Producer_name* *(Each album has a unique record label and producer.)* ***FD5:*** *Song_title → Streaming_platform, Language* *(Each song is available on a specific platform and is sung in a specific language.)* ***FD6:*** *Streaming_platform → Country* *(A streaming platform operates primarily in a particular country.)* ***FD7:*** *Song_title → Downloads, Awards_won* *(The number of downloads and awards won by a song is determined by the song's title.)* *i. What normal form is the relation in and which normal form does it violate? Explain your answer. (3 Marks)* *ii. Apply normalization until you cannot decompose the relations further. (7 Marks)*	10
2		Consider the following database schema for an Employee Management scenario: Employee Management Database Schema: Employee: (E_id, E_name, Department, Job_Title) Department: (Dept_id, Dept_name, Manager) Project: (Project_id, Project_name, E_id) Salary: (Salary_id, Amount, E_id, Dept_id) Write the SQL and Relational Algebra expression for the following: (i) List all employee names along with their department name who receive more than 600000 as salary. (2 Marks) (ii) Display all project names that are managed by employees in the "IT" department. (2 Marks) (iii) Count the total number of employees working under the "HR" department and receives more than the average salary of all the employees. (2 Marks)	15

		(iv) Select the details of employees who are earning a salary greater than 50,000 along with their job titles. (2 Marks) (v) Apply query optimization for any of the question of your choice from (i) to (iv) and specify the optimal relational algebra expression for the same. (7 Marks)	
3		**(a)** Consider the **Key Values**: (8, 15, 25, 30, 7, 10, 20, 5, 22, 76, 34, 27, 89, 94, 12, 35, 40, 50, 60). Illustrate the step by step insertion of these key values into the B+- tree, with the order p=3 and pleaf=2. (7 Marks) **(b)** Delete the values 35, 22 and 60 from the B+Tree. Show the updated structure after each deletion. (3 Marks) *Note*: Every insertion and deletion has to be specified in a separate tree.	10
4		Consider an extendible hashing scheme with a bucket size of 4. Assume the following keys are inserted in the given order: 45, 38, 14, 67, 10, 27, 92, 33, 75, 20. The hash address of the key values are as follows: 45 (00101101), 38 (00100110), 14 (00001110), 67 (01000011), 10 (00001010), 27 (00011011), 92 (01011000), 33 (00100001), 75 (01001011), 20 (00010100). Show the state of the directory and buckets after each insertion, including any necessary splitting or merging operations. (Consider the Least Significant Bits for the above-mentioned process)	5
5		Consider the given schedules S1, S2, …. S5. Discuss whether each of the schedule is conflict serializable or not using the precedence graph. Justify your answer (5*2=10 Marks) S1: r1(X); w1(X);r 2(X); w2(X); r1(Y); w1(Y); r3(Y); w3(Y); r2(Z); w2(Z); r3(Z); w3(Z). S2: r1(A); r2(B); w1(A); r3(A); w2(B); r2(A);w3(A); r3(B); w1(B) S3: r1(M); w1(M); r2(M); w2(M); r3(N); w3(N); r2(N);w1(N); w3(M) S4:r1(P);w1(P);r2(Q);w2(Q);r1(Q);w1(Q);r2(P);w2(P) S5:r1(K);w1(K);r2(K);r3(L);w2(K);w3(L);r1(L);w1(L);w3(K)	10