



VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UIR Act, 1964)
CHENNAI

Reg. Number:

Continuous Assessment Test (CAT) – II - October 2025

Programme	: B.Tech	Semester	: Fall Semester 2025-26
Course Code & Course Title	: BCSE302L Database Systems	Slot	: B1+TB1
Faculty	: Dr.Jani Anbarasi L Dr.Bhuvaneswari Dr.Ashoka Rajan R Dr.Leninisha Shanmugam Dr.Vijayakumar K P Dr.Sandhya Dr.Sujatha M	Class Number	: CH2025260100624 CH2025260100628 CH2025260100625 CH2025260100632 CH2025260100622 CH2025260100634 CH2025260100630
Duration	: 90 Minutes	Max. Mark	: 50 Marks

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks																		
1		Consider the below given relation and the functional dependencies and apply normalization until it reaches Boyce Codd Normal Form. (a) R (A,B,C,D,E,F,G,H,I,J,K) FD = {A→BCD, E→FGHI, J→K, H→I, EJ→G} (b) R (A,B,C,D,E,F,G,H) FD = {AB→CD, B→E, E→F, F→G, G→H, C→A }	10																		
2		Consider the following and write the SQL and the Relational Algebra queries for the following Employee <table><tr><th>Eid</th><th>Ename</th><th>City</th></tr><tr><td>101</td><td>Ravi Traders</td><td>Mumbai</td></tr><tr><td>202</td><td>Star Supplies</td><td>Pune</td></tr><tr><td>303</td><td>Maxx Enterprises</td><td>Delhi</td></tr><tr><td>404</td><td>QuickParts</td><td>Mumbai</td></tr><tr><td>505</td><td>Nova Tools</td><td>Chennai</td></tr></table>	Eid	Ename	City	101	Ravi Traders	Mumbai	202	Star Supplies	Pune	303	Maxx Enterprises	Delhi	404	QuickParts	Mumbai	505	Nova Tools	Chennai	10
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Items

IID	Iname
A1	screws
B2	washers
C3	gears
D4	bearings
E5	shafts

Inventory

Eid	IID	icost
101	A1	50
101	C3	120
202	A1	55
202	D4	75
303	B2	20
404	A1	48
404	B2	22
404	E5	95
505	C3	110
505	D4	70

1. Retrieve the **item names** supplied by employees located in **Mumbai**.
2. Retrieve the **Eids** of employees who supply **every item**.
3. For each employee, retrieve **Eid** and the **number of distinct items** available in the inventory.
4. Retrieve the **employee names** who have **not listed any items** in the inventory.
5. Retrieve the **Eid** of the employee(s) who have listed the **minimum cost** for the item screws.

3

An open-addressed hash table has $m = 8$ slots and is initially empty. Insert the following keys one by one:

12, 47, 33, 28, 19, 44, 50, 37, 15, 25

Perform the insertions using the following probing strategies:

1. Quadratic Probing: (2 Marks)

- Use the hash function $h(k, i) = ((k \times 5 + 1) + i^2) \bmod 8$, where $i = 0, 1, 2, \dots$ until an empty slot is found.

2. Double Hashing: (3 Marks)

- Use Hash Function 1: $h_1(k) = k \bmod 8$

10

	• Use Hash Function 2: $h_2(k) = 5 - (k \bmod 5)$ • The probe function is $h(k, i) = (h_1(k) + i \times h_2(k)) \bmod 8$, where $i = 0, 1, 2, \dots$ until an empty slot is found. An extendible hashing file organization starts with a global depth of 1, a bucket capacity of 3, and two directory entries pointing to two buckets (Bucket 0 and Bucket 1). Insert the following keys in order: 7, 18, 23, 12, 25, 6, 10, 17, 20, 8, 13 and 22 Show the step-by-step insertion of each key, indicating bucket splits, directory doublings (if any), and changes in the local depth of affected buckets. (5 Marks)	
4	A sequence of keys is inserted one by one into a search structure (B+tree) of order 4. All insertions are right biased. You are expected to: - Show how the structure evolves during the process. - Ensure that the final form of the structure satisfies all its properties. The sequence of keys for insertion is (7 Marks): Y, J, G, D, T, E, O, A, N, L, R, V, I, K, Q, B, S, M, U, P After building the structure, remove the following values in order: L, J, I, Y from the constructed B+ tree (3 Marks)	10
5	Consider the following three schedules involving transactions T1, T2, and T3. (Notation: In the following, NYO represents the action Y (R = Read, W = Write) performed by transaction N on object O.) (S1) 2RA 2WA 3RC 2WB 3WA 3WC 1RA 1RB 1WA 1WB (S2) 3RC 2RA 2WA 2WB 3WA 1RA 1RB 1WA 1WB 3WC (S3) 2RZ 3RC 3WA 2WA 2WB 3WC 1RA 1RB 1WA 1WB • Construct the precedence (conflict) graph for each schedule. • Determine which of the schedules (S1, S2, S3) are conflict equivalent to each other • Justify your answer with proper reasoning.	10
*****All the best *****		

Sellam