



SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2026-2027

Programme Name & Branch : B.Tech CSE(Cybersecurity &AIDE)
Course Code and Course Name : BACSE202 Database Systems
Faculty Name(s) : Ranichandra C, Jayaram Reddy A, Thanga Mariappan L
Class Number(s) : VL2026270102651, VL2026270102641, VL2026270102655
Date of Examination : 28th September 2026 - 04.30PM to 06.00PM
Exam Duration : 90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes (Type the CO statements covered in this question paper. Use the CO number as per the syllabus copy)

CO1: Understand the role of database management systems in organizations and design relational data models and their operations.

CO2: Analyze and apply indexing structures for efficient data access and query optimization.

Q. No	Question	M	CO	BL
1.	Consider the following relations Train (Tr_no, name, source, destination, start_time, reach_time), Passenger (PNR_No, Serial_no, Name, Sex, Address, Age, Date of Journey, Status, kind of seat, seat no, tr_no) Write relation algebra expressions for a) Find the train names that start from Katpadi. b) List the number of passengers in each train. c) List all the train numbers and its names along with passenger names if it is reserved. d) List the passenger names who have reserved in all trains starting from Chennai. e) Find the passenger details whose journey is not confirmed.	10	1	3
2.	Thirty thousand student records are stored in unspanned form on a double-sided disk pack consisting of 10 disks, with 20 tracks on each surface and 20 blocks of 512 bytes per track. The structure of each student record is: Student(Regno : VARCHAR(10), 10 Name : VARCHAR(50), 50 DOB : DATE, → 8 bytes Batch : NUMBER(4), 4 Programme : VARCHAR(8), 8 School : VARCHAR(28) 28) Assume that the VARCHAR fields occupy their maximum specified length and an index pointer occupies 8 bytes. The DATE field occupies 8 bytes.	10	1	3



VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of U.G.C. Act, 1956)

REG.NO.:

SLOT: B1+TB1

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Session: IV

	Compare and contrast the following indexing schemes. For each index, determine the appropriate index structure and discuss its storage requirements and access efficiency. a. Primary index on Regno b. Clustered index on School c. Secondary index on DOB			
3.	Consider the relation REFRIG(Model#, Year, Price, Manuf_plant, Color), which is abbreviated as REFRIG(M, Y, P, MP, C), and the following set F of functional dependencies: $F = \{M \rightarrow MP, \{M, Y\} \rightarrow P, MP \rightarrow C\}$ a) Evaluate each of the following as a candidate key for REFRIG, giving reasons why it can or cannot be a key: $\{M\}, \{M, Y\}, \{M, C\}$. b) Consider the decomposition of REFRIG into $D = \{R1(M, Y, P), R2(M, MP, C)\}$. Is this decomposition lossless? Show why?	10	1	3
4.	Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies $F = \{\{A, B\} \rightarrow \{C\}, \{A\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G, H\}, \{D\} \rightarrow \{I, J\}\}$. a) What normal form is the relation in? Explain your answer. b) Apply normalization until you cannot decompose the relations further. State the reasons behind each decomposition.	10	2	3
5.	Consider the following relations: • CUSTOMER(Customer_ID, Customer_Name, City) • LOAN(Loan_ID, Customer_ID, Branch_ID, Amount, Status) • BRANCH(Branch_ID, Branch_Name, City) A bank wants to retrieve the customer name, branch name, and loan amount for all approved loans satisfying the following conditions: • The customer is from Vellore. • The loan amount is greater than ₹5,00,000. • The loan status is APPROVED. • The loan is issued by a branch located in Chennai. a) Write an SQL query to retrieve the required information. b) Construct the initial query tree corresponding to the SQL query written in (a). c) Apply appropriate heuristic query optimization rules to transform the initial query tree into an optimized query tree. Clearly show each transformation and explain how it reduces the size of intermediate results.	10	2	3
