2123
B.E. (Computer Science and Engineering)
Third Semester
CS-302: Database Systems

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C.*

x-x-x

	Section-A	
1.	a) Define DBMS. State different components of DBMS.	10
	b) Differentiate between Sparse index and dense index.	
	c) Let a Relation **R** have attributes {A1, A2, A3,...,An} and A1 is the candidate key. Find number of possible super keys of R.	
	d) Define term deadlock. When might a deadlock occur?	
	e) Explain any two commands of DDL, DML and DCL.	
	Section-B	
2.	a) Differentiate between file-based management system and database management system on below parameters with suitable examples. - Backup and recovery, - query processing and - integrity constraints.	5
	b) Explain B+Tree indexes on multiple keys with suitable example.	5
3.	a) An organization stored its data in file system and used the following C structure to maintain the employee information: struct employee (　int eid; 　　char name[10]; 　　char dept[5]; }; The organization similarly stores other relevant information using various structures and stores them in files. But now the organization wants to adopt database for better data management. Diagrammatically represent the difference between the three-level data abstraction of the above code while its migration to the database.	5
	b) Describe the following commands in Relational Algebra. 　i) Select　ii) Join　iii) Union　iv) Product	5
4.	a) Define View. What are the advantages of using View in SQL. Explain with help of suitable example.	5
	b) Create an Entity-Relationship (ER) model for a library database, including entities, attributes, and relationships. Explain how the model represents the information about books, authors, and borrowers, and specify any constraints you think are relevant.	5

Section - C

5.	a) Discuss the meaning of ACID properties in Transaction management.	5
	b) What is concurrency control in a DBMS, and why is it necessary? Compare and contrast optimistic and pessimistic concurrency control mechanisms.	5
6.	a) Discuss steps involved in implementing shadow paging in a database system. Provide examples of real-world database systems or applications that use shadow paging.	6
	b) Consider a simple check-pointing protocol and the following set of operations in the log. (start, T4); (write, T4, y, 2, 3); (start, T1); (commit, T4); (write, T1, z, 5, 7); (checkpoint); (start, T2); (write, T2, x, 1, 9); (commit, T2); (start, T3); (write, T3, z, 7, 2); If a crash happens now and the system tries to recover using both undo and redo operations, what are the contents of the undo list and the redo list?	4
7.	a) Consider a database system with two transactions, T1 and T2, and three database schedules: Schedule 1: T1: R(A), T2: R(A), T1: W(A), T2: W(A) Schedule 2: T1: R(A), T2: R(A), T2: W(A), T1: W(A) Schedule 3: T1: R(A), T2: R(A), T1: W(A), T2: W(A) where R(A) denotes a read operation on data item A, and W(A) denotes a write operation on data item A. Identify whether each of the schedules is conflict-serializable or not. Justify your answer.	5
	b) How does encryption play a role in enhancing the security of a DBMS, and what are the different encryption methods commonly used in this context?	5

x-x-x