Exam.Code:0915
Sub. Code: 33422

2076

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

Q1. a) What is data independence? Differentiate between logical and physical data independence. 10

b) Differentiate between relational algebra and relational calculus.

c) What is aggregation in ER modeling?

d) Differentiate between deferred update and immediate update.

e) What is a multivalued dependency ?

Section-B

Q2. a) A hospital maintains information about patients, doctors, and appointments. Each patient can consult multiple doctors, and each doctor can treat many patients. 5

i) Identify the entities and relationships involved.

ii) Draw the ER diagram.

b) A bank maintains 10 lakh customer records. Searching customer details by account number takes considerable time. Suggest and explain a suitable indexing technique. 5

Q3. Differentiate between 10

a) Fixed-Length Records vs Variable-Length Records

b) Clustered Index vs Non-Clustered Index

c) Hierarchical Model vs Relational Model

d) Strong Entity vs Weak Entity

e) DDL vs DML

Q4. a) Explain the following relational algebra operations with examples: 5

Selection (σ) , Projection (π), Union ($\cup$) ,Set Difference (-) and Cartesian Product ($\times$).

b) Discuss the process of querying relational data using Relational Algebra and Relational Calculus. 5

P.T.O.

Section-C

Q5. a) Discuss the various anomalies that occur in an unnormalized database. How does normalization eliminate these anomalies? 5

b) What are multivalued dependencies? Explain Fourth Normal Form (4NF) with suitable examples. 5

Q6. a) Consider the following schedule involving three transactions T1, T2, and T3 operating on data items A and B: S: R1(A), W2(A), W1(B), R3(B), R2(B), W3(A). List all conflicting operations and construct the precedence graph for the above schedule. Determine whether the schedule is conflict serializable or not. 5

b) A database system takes a checkpoint while transactions T1 and T2 are active. After the checkpoint, T1 commits but T2 does not, and the system crashes. Explain how checkpoint helps in reducing the recovery work in this case. 5

Q7. a) Discuss the different types of database security threats and protection mechanisms. 6

b) Explain Shadow Paging with advantages and disadvantages. 4

x-x-x