16 (CS 671) DBMS

2018C

DATA BASE MANAGEMENT SYSTEM

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following :

   (a) What is redundancy? Can data redundancy be completely eliminated when database approach is used? 5

   (b) What are the basic approaches of Network model and Hierarchical data model? 5

   (c) What are the role of DBA in DBMS? 5

   (d) How are the outer join operations different from the inner join operations? 5

Contd.

2. Answer the following :

   (a) Differentiate between entity integrity and semantic integrity with suitable examples. 5

   (b) Define Codd's rule (max eight). What is aggregation? 5

   (c) Define candidate key, alternate key, super key with suitable examples. 5

   (d) What are the different types of relationships that can be depicted through an ER model? Explain the concept of ER model using the case study of a Ticket Reservation system that has here entities Ticket, Passenger and train. Assume that each passenger can buy more than one ticket. 5

3. (a) Can a relation have more than one foreign key? Explain with the help of an example. 5

   (b) What is view? List *two* reasons why we may choose to define a view. 5

   (c) Differentiate between the FIRST and SECOND normal form using suitable examples. 5

   (d) Using suitable examples, explain the Multi-valued dependencies in detail. 5

4. (a) Explain the concept of Hash based indexing in detail. 5

(b) What is file organization? Explain how data is stored on external storage. 5

(c) What do you mean by schedule? Explain conflict serializability and view serilazability. 5

(d) What is a participation constraint? Explain total and partial participation constraints. 5

5. (a) What is two phase locking? Explain static and dynamic two phase locking. 5

(b) Two phase scheduler is subject to deadlock. Explain with example. 5

(c) "Withdraw Rs. 1000 from a saving account using ATM". How can ACID properties be ensured for the above transaction? Explain. 5

(d) What is the difference between shared lock and exclusive lock mechanism with *one* example each? 5

(b) Consider three transactions T_1, T_2 and T_3 and two schedules S_1 and S_2 given below. Draw the precedence graph for schedules S_1 and S_2 and test whether they are conflict serializable or not.

$T_1 : r_1(P) ; r_1(R) ; w_1(P) ;$
$T_2 : r_2(R) ; r_2(Q) ; w_2(R) ; w_2(Q)$
$T_3 : r_3(P) ; r_3(Q) ; w_3(Q) ;$

$S_1 : r_1(P) ; r_2(R) ; r_1(R) ; r_3(P) ; r_3(Q) ; w_1(P) ; w_3(Q) ; r_2(Q) ; w_2(R) ; w_2(Q) ;$

$S_2 : r_1(P) ; r_2(R) ; r_3(P) ; r_1(R) ; r_2(Q) ; r_3(Q) ; w_1(P) ; w_2(R) ; w_3(Q) ; w_2(Q) ;$ 10

7. Write short notes on : ***(any two)*** 10+10=20

(a) Sparse Index & Dense Index

(b) Steps of query processing

(c) Quantifiers in relational calculus

(d) ACID properties of transaction.

Total number of printed pages–4

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*Answer question no. **1** and **any four** from the rest.*

1. (a) How does a B tree differ from B^+ tree ? 4

(b) Differentiate between left outer join and right outer join with the help of an example. 4

(c) What is view serializability ? 4

(d) List *four* advantages of DBMS. 4

(e) What is precedence graph ? 4

Contd.

2. (a) Distinguish between Centralised and Distributed systems. 5

(b) What are fragmentation and replication ? 5

(c) List down *at least five* rules specified by CJ Date regarding DDBMS. 5

(d) What is shared nothing and network architecture with *one* centralised database w.r.t. DDBMS ? 5

3. (a) How does tuple relational calculus differ from domain relational calculus ? 5

(b) What is functional dependency ? How is it different from multi-valued and join dependencies ? Give an example each of multi-valued and join dependency. 5

(c) What is degree ? What do you mean by the term Cardinality ? What are the difference between candidate key and alternate key ? 2+2+4=8

(d) What is Thomas write rule ? 2

4. (a)

(b)

(c)

5 (a)

(b)

6 (a)

4. (a) When is it preferable to use dense index rather than a sparse index ? Justify your answer. 6

(b) Construct a B^+ tree for the following set of key values :
(2, 3, 5, 7, 11, 17, 19, 23, 29, 31)
Assume that the number of pointers in one node is four. 10

(c) What is Static hashing ? 4

5. (a) What is a Query execution/evaluation plan ? Explain the heuristics used for query optimization. 2+8=10

(b) What is a nested query ? Give an example. Draw the initial query tree for your choice as a query tree. 2+4+4=10

6. (a) What do you mean by Concurrency problem ? Three transactions A, B and C arrive in the time sequence A, then B and then C. The transaction are run concurrently on the database. Can we predict what the result be if 2PL is used ? Explain briefly. 10