151

UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

UCSC

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Academic Year 2018/2019 – Second Year Examination – Semester II – 2019

SCS2209 – Database II / SCS 2109 – Database II (R1)

TWO (2) HOURS

To be completed by the candidate

Examination Index No: .....

Important Instructions to candidates:

1. The medium of instruction and question is **English**.
2. **Write your answers in English.**
3. If a page or a part of this question paper is not printed, please inform the supervisor immediately.
4. Note that questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
5. Write your index number on each and every page of the Question paper.
6. **This paper consists of 04 questions in 16 pages.**
7. Answer **ALL** questions. All questions carry equal marks (25 marks).
8. Any electronic device capable of storing and retrieving text including electronic dictionaries and mobile phones are **not allowed**.
9. Non-Programmable Calculators are **allowed**.

For Examiner's use only	
Question No	**Marks**
1	
2	
3	
4	
Total	

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1. (a) Briefly describe current outstanding challenges for database security with the help of security goals.

[3 Marks]

(b) Complete the table given below appropriately.

[5 Marks]

	Security Issue type
Before finalizing a loan in the ABC bank, it hides some of the terms and conditions, credit limits to the customer.	
Not able to protect cardholders data.	
Patient medical records can only view to the doctors. But XYZ hospital receptionist can access all the medical records of its' patients.	

PQR Company computers do not have installed a good virus guard.	
An Insurance company shares/pass their customer's personal information with a travel agency. .	

(c) Write SQL statements to perform the following tasks.

Consider a database applicationDB that stores details related to login of readers and writers. Admin is the super user in the database. Suppose Admin has created a table logInfo which contains ID, SourceID, data and Event details.

LogInfo (ID, SourceID, data, Event)

i. Since there are many users in the applicationDB, Admin decided to introduce different roles and assign privileges to those roles. Initially two new roles; readerlog and writerlog were created. Writerlogs' password is "wr123".

[4 Marks]

ii. Admin authorizes read only privileges on LogInfo to readerlog and he removes write privilege from writerlog.

[4 Marks]

iii. The Admin authorizes two users Jack and Rose to use administrative privileges.

[3 Marks]

(d) Consider the following relationa "StudentDetails".

StudentDetails;

StuID	LName	Fname	Age	Sex	Advisor	city_code
1001	Smith	Linda	18	F	1121	BAL
1002	Kim	Tracy	19	F	7712	HKG
1034	Epp	Eric	18	M	5718	BOS
1035	Schmidt	Sarah	26	F	5718	WAS

i. Write a stored procedure to return the StuID and his/her full name for a given StuID. You need to remove the stored procedure if it is already in the database.

Hint: Stored Procedure Name – FindStudent

Output:

StuID	Student Name
1001	Linda Smith

[4 Marks]

ii. When you call the Stored Procedure "calculate", it should return the summation of given two marks of a student. (P = Q+R)

[2 Marks]

2. (a) Consider the following relational schema for the Sri Lankan volleyball tournament.

PLAYER (PlayerId, Name, Team, Height, Birthday, PlayedMatches)

PLAYED (MatchId, PlayerId, Role, ScoredPoints)

Build a trigger named UpdatePlayedMatches that keeps PlayedMatches of PLAYER updated after insertions in PLAYED.

[5 Marks]

(b) The following relational schema manages the friends in ABC College.

Collage(ID int, name text, grade int);
Friend(ID1 int, ID2 int);
Likes(ID1 int, ID2 int)

i. Write a trigger to maintain symmetry in friend relationships. Specifically, if (X,Y) is deleted from Friend, then (Y,X) should also be deleted too.
(Trigger name : Friend_Delete)

[5 Marks]

ii. Write a trigger that automatically deletes students when they graduate, i.e., when their grade is updated to exceed 75. (Trigger name : Graduation)

[5 Marks]

(c) Hash file organization uses a hash function to map a key into a bucket number. Bucket overflows are possible in hashing. Briefly explain the techniques use to manage bucket overflows in hashing.

[2 Marks]

(d) Consider the following table used by WHO to store information about Patients infected by a Virus with their city of residence.

Patient (p_ID, pName, NIC, Address, ContactNo, City)

Assume Patient file is ordered on non-key field 'City'. There are 500 different cities in the file. This file has 34,000 fixed-length records of size R = 30 bytes stored on a disk with block size B = 512 bytes in an unspanned manner.

i. Calculate the number of disk blocks required to store the student file.

[2 Marks]

Suppose that clustered index file is created to improve the performance. Each index entry is 15 bytes long.

ii. Calculate the total number of index entries. [2 Marks]

iii. Calculate the number of disk blocks required to store the index file. [2 Marks]

iv. Calculate the number of block accesses if binary search is performed. [2 Marks]

3. (a) A State Transition diagram shows how a transaction moves through its execution states. Identify the main states of a transaction using a state transition diagram. [5 Marks]

(b) Consider the transactions T1, T2 and T3 and the schedules S1 and S2 given below. (time goes from top to bottom).Draw the precedence graph and check whether this schedule is conflict-serializable? If it is, give an equivalent serial schedule. If not, explain why ? Label the edges with the data that causes the conflict.

T1: R1(X), R1(Z), W1(X), W1(Z)
T2: R2(Y), R2(Z), W2(Z)
T3: R3(Y), R3(X), W3(Y)

Note: R1(X) denotes Transaction 1 Read value X.
W2(X) denotes Transaction 2 Write value X.

i. S1: R1(X), R3(Y), R3(X), R2(Y), R2(Z), W3(Y), W2(Z), R1(Z), W1(X), W1(Z)

[4 Marks]

ii. S2: R1(X), R3(Y), R2(Y), R3(X), R1(Z),R2(Z), W3(Y), W1(X), W2(Z), W1(Z)

[4 Marks]

(c) Consider the following two transactions T1 and T2 executed concurrently on the Employee(emp_ID, Name, Department) relation. Initial Employee relation with data is given below.

Employee

Emp_ID	Name	Department
1	Gathika	6

T1	T2
INSERT INTO Employee VALUES (2,'Nimal',5); INSERT INTO Employee VALUES (3,'Saman',8); INSERT INTO Employee VALUES (4,'Gamunu',8); UPDATE Employee SET Department=5 WHERE Name= Gathika;	
	INSERT INTO Employee VALUES (5,'Gamini',4); INSERT INTO Employee VALUES (6,'Sanduni',3); DELETE FROM Employee WHERE name LIKE 'Ga%'; INSERT INTO Employee VALUES (7,'Thamali',6);
DELETE FROM Employee WHERE name LIKE 'Sa%'; COMMIT;	
	DELETE FROM Employee WHERE name LIKE 'Ni%'; COMMIT;

i. What are the possible contents of Employee table after each serial execution of the two transactions? Explain your answer.

[2 Marks]

ii. Suppose that the transactions are run at isolation level REPEATABLE READ and the commands are issued in the order indicated above. What would be the content of Employee table after the execution? Explain your answer.

[4 Marks]

(d) i. Briefly explain the term 'recoverable schedule' in database concepts.

[2 Marks]

ii. Consider the schedules S1 and S2 given below. Determine whether each schedule is recoverable, or nonrecoverable. Justify your answer.

S1: R1(X), R2(Z), R1(Z), R3(X), R3(Y), W1(X), C1, W3(Y), C3, R2((Y), W2(Z), W2(Y), C2;
S2: R1(X), R2(Z), R1(Z), R3(X), R3(Y), W1(X), W3(Y), R2(Y), W2(Z), W2(Y),C1, C2, C3;

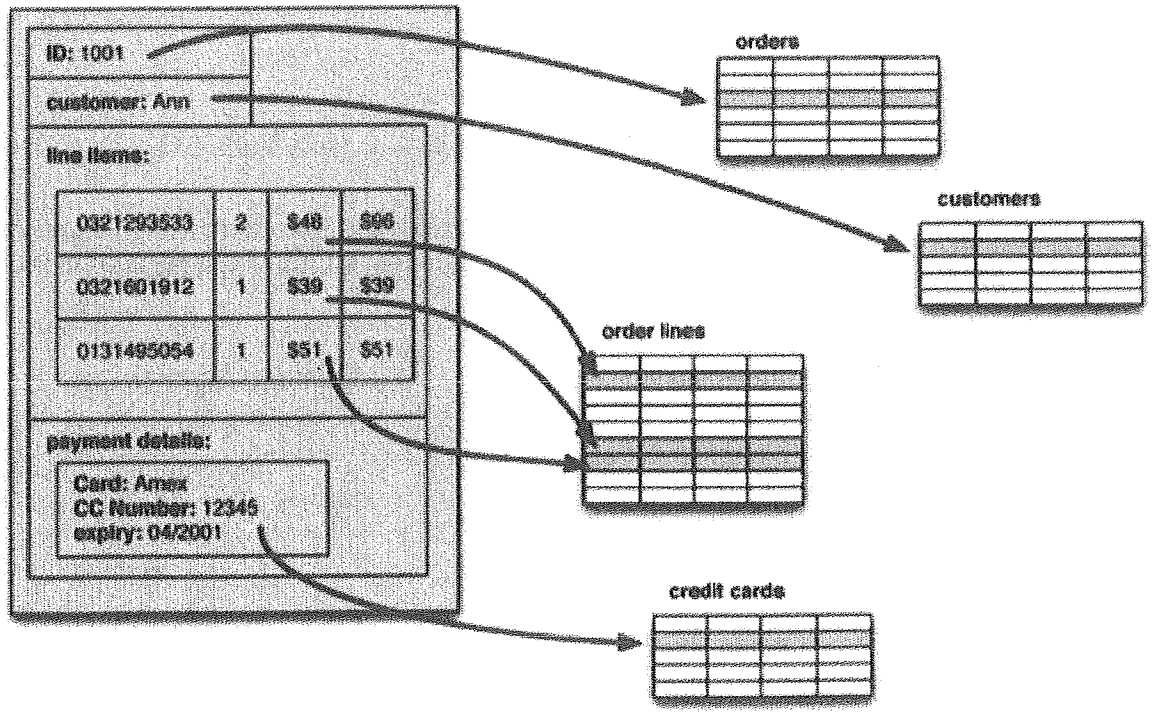
[4 Marks]

Index No: .....

4. (a) There is an enterprise system in trading industry that is developed using a RDBMS. What are the advantages and disadvantages you would get if you replace the RDBMS database with a NOSQL database?

[4 Marks]

(b) Assume that you need to bring the following order built using RDBMS to NOSQL. What is/are the aggregates you would create to facilitate order retrieval using order id? Justify your answer.



[4 Marks]

(c) In addition to retrieving orders, it is found that the sales team need an analytical report to see most demanding price range for a given period. What changes / additions you would make to the aggregates to facilitate this? Justify your answer.

[4 Marks]

(d) This enterprise system is a heavily loaded system. What is the approach and algorithm used to get the above report to see most demanding price range for a given period. (Consider $50 for each price range)

Illustration the algorithm using some relevant data from the above scenario.

[5 Mark]

(e) If the system is distributed in multiple countries, how could the above report be generated?
[2 Marks]

(f) What is the suitable Nosql database to store the order details?
[2Marks]

(g) How could the sharding and replication happen to make sure high response time and high availability in multiple countries. What is the shard key? Explain your answer.

[4Marks]

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