3rd year 1st semester.

Uva Wellassa University of Sri Lanka
Faculty of Science & Technology
Department of Computer Science & Technology
First Semester Examination March/April 2013
CST325-2/ IIT411-2 Advanced Database Management Systems

Answer **All** questions
Time Allowed: **Two (02) hours**

01.

a)

i. Discuss the different types of transaction failures. What is meant by catastrophic failure?

ii. Discuss the Deferred Update Technique of recovery. What are the advantages and disadvantages of this technique? Why is it called the NO-UNDO/REDO method?

iii. Describe the shadow paging recovery technique. Under what circumstances does it not require a log?

iv. Describe the three phases of the ARIES recovery method.

b)

i. What are the objectives of database normalization?

ii. Define the following:
Second normal form
Third normal form
Boyce-Codd normal form (BCNF)

i. Why do practical database designs typically aim for BCNF and not aim for higher normal forms?

ii. When a relation is not in a particular normal form, it is normalized into that from by doing decomposing. What are the factors to be considered in normalizing a relation? Illustrate your answer with suitable examples.

02.

a)

i. What is a transaction in DBMS?

ii. Briefly explain lost update problem and dirty read problem by providing examples for each.

iii. State and discuss the states of transaction.

1p

b) Consider the two transactions T1 and T2 given below (Table 01) which act on two bank accounts A and B. Using the two transactions give examples for each of the schedules given below.

i. Serial schedule

ii. Interleave schedule

Table 01

T1	T2
Read(A) A=A-5 Write(A) Read(B) B=B+50 Write(B)	Read(A) Temp=A*0.1 A=A-temp Write A Read (B) B=B+temp Write(B)

c) Consider the flowing transactions arranged in a schedule S (Table 02):

Table 02

T0	T1	T2
Read(x) x=x-7 Write(x)		Read(x) Read(y) y=y+7 x=x*2
	Read(y) y=y+2 Write(y)	
Read(y) y=y*2 Write(y)		Write(x) Write(y)

Is schedule S a serial Schedule? If not, Why?

Is schedule S a serialized schedule? If not, rearrange the operation to obtain a serialized schedule.

d)

i. Briefly describe why concurrency control is needed in transaction processing?

ii. Why we use two phase locking instead of Exclusive locking?

iii. Consider the following transaction T1, check whether the T1 obey the two phase locking protocol? If not rewrite the T1 which obey the Strict Two phase locking protocol.
T1:Read_lock(A);Write_item(A);Unlock(A);Write_lock(C);Read_item(C);C=C+2;
Write_item(C);Unlock (C)

03.

a) Explain the difference between dense and sparse index.

b) What are the three available alternatives for creating database indexes?
Is it possible to create sparse index for any relation?
Is it possible to create sparse index with alternative one?
Is it possible to create dense on a sorted relation using any alternative?
How could you create a primary index on a relation?

c) Consider the animal data given below (showing the block on memory)

Block 01

Block 02

Block 03

ANO	ANAME	TYPE
A001	SUDU	CAT
A002	REX	DOG
A003	PETHTHA	BIRD
A004	BANTY	DOG
A005	KIRI	CAT
A006	BINGO	DOG
A007	BINDU	DOG
A008	KUMARI	CAT
A009	BINGO	DOG

Using above data draw an example for each index type given below
Primary index using alternative 2
Dense index on ANAME using alternative 3
Sparse index on (ANO, ANAME) using alternative 2
Dense index on (ANO, ANAME) using alternative 2
Sparse index on (ANO, TYPE) using alternative 3

04.

a) What is the goal of query optimization? Why it is important?

b) What are the steps in query processing? Briefly explain each step.

c) Discuss the reasons for converting SQL queries into relational algebra queries before optimization is done.

d) Discuss the different algorithms for implementing each of the following relational operators and the circumstances under which each algorithm can be used: SELECT, PROJECT, UNION

e) How does a query tree represent a relational algebra expression? What is meant by an execution of a query tree?

f) Convert the following SQL query into relational algebra, and represent it using a query tree

Select P.PNUMBER, P.DNUM, E.LNAME, E.ADDRESS, E.BDATE from PROJECT AS P, DEPARTMENT AS D, EMPLOYEE AS E where P.PLOCATION = 'STAFFORD 'and P.DNUM = D.DNUMBER and D.MGRSSN = E.SSN;