THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

FINAL EXAMINATION 2007
BACHELOR OF TECHNOLOGY – COMPUTER ENGINEERING

ECX5240 – INFORMATION SYSTEMS

DATE: May 7, 2008 **TIME: 1330-1630 hrs**

Answer **only five** questions.

1.

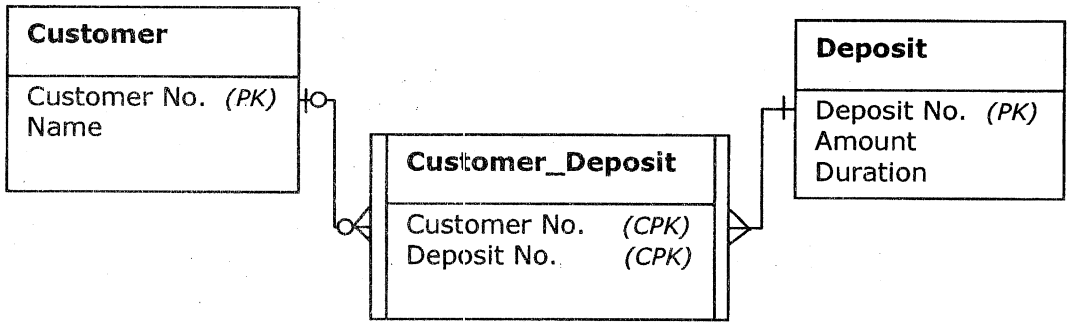
a) (8 Marks) Briefly explain the phases of designing a database system. Indicate which phases are DBMS independent and which are not.

b) (4 Marks) How do you ensure, as the DBA, that only authorised people can access a particular set of tables.

c) (4 Marks) Briefly explain the significance of *application domain knowledge* in optimizing a query.

d) (4 Marks) What is "data localisation" in respect to distributed database systems?

2. Consider following ER diagram to answer this question.



a) Write SQL queries for following statements.

I. (4 Marks) Select the total amount of all the deposits under the each *"duration"*, only if the total amount is greater than Rs. 1,000,000.

II. (4 Marks) Select the customer number of the customers who have no deposits at the moment.

III. (3 Marks) Translate the following SQL query into plain English.

```
select deposit_no
from deposit
where amount in
        (select min(amount)
        from deposit where
        deposit_no in
                (select depo_no from depo_cust
                group by depo_no
                having count(*)=1))
```

b) (5 Marks) You are asked to create an index on an appropriate column in order to increase the performance of the above query (a.III). Suggest the table and the column on which you create the index. Justify your answer.

c) (4 Marks) If you are to implement the above query (b) on a DBMS you are familiar with, briefly explain how you can check whether the query is performing the way you want.

3.

a) (8 Marks) List three current issues in query optimization? And briefly explain why uncertainty has become one of them.

b) (4 Marks) List four parameters that are accountable in cost estimation of a database query plan.

c) (8 Marks) Explain following statements in relation to database query execution plans.

"Moving SELECT and PROJECT operations down the tree"
"Applying the most restrictive *SELECT* operation first"
"Avoiding *CARTESIAN PRODUCTs*"

4.

a) Relational schemas for five relations in a movie database are as follows.

Movie (movieName, whenMade)
Star (starName, age, gender)
StarsIn (starName, movieName, Charge)

Formulate following statements in relational algebra.

I. (3 Marks) Find the starName and the charge of stars who appeared in the movie *"movie1"*

II. (3 Marks) Find the starNames who appears in movie "movie3" and the charge is over one million rupees.

III. (4 Marks) Find the names of the actors *(gender=male)* over 40 or appears in movie *"movie2"*

IV. (4 Marks) Find the pairs of starNames such that the first star has charged more for some film than the second star. (hint: You may want to use two instances of starsIn relation)

b) (6 Marks) In practice why do we want tables to be normalized up to BCNF? Explain using an example.

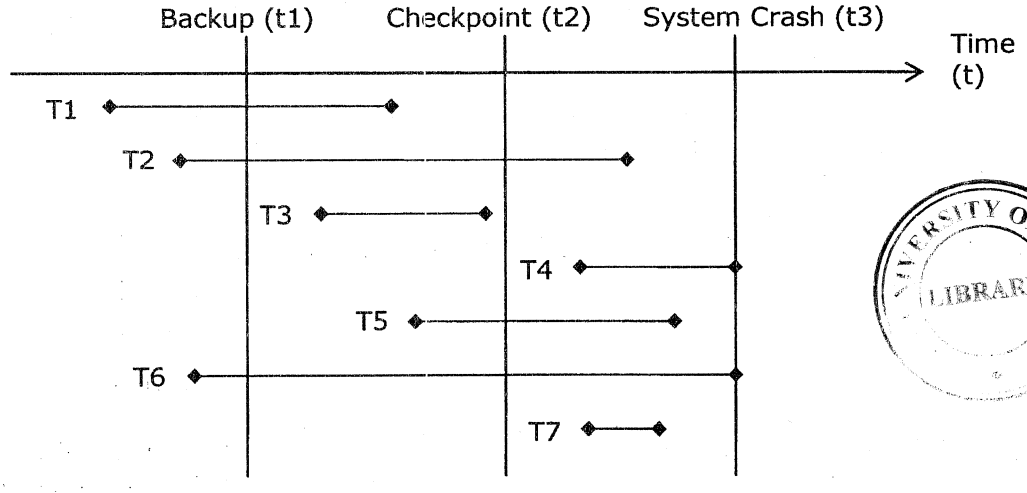
5.

a) (3 Marks) List five proactive measures that can be taken to help prevent security breaches?

b) (9 Marks) In a database recovery, the amount of work and the use of log operations depend on the timing of the database. For local failures and system failures the recovery process depends on when database changes are recorded on disks. Database changes can be recorded before the commit (immediate update) or after the commit (deferred update) of a transaction.

Assume you are to suggest a suitable approach, out of the above two, for an application. Explain what you would consider in order to make that decision?

c) (6 Marks) According to your database update approach, list the recovery steps for each transaction, to restart the system assuming a system crash occurs at t3.



d) (2 Marks) Under which situation would you restore the database backup?

6.

a) (7 Marks) Explain the following statement "Contemporary SOA *(Service Oriented Architectures)* increases quality of service"

b) (7 Marks) Explain major impacts high speed networks have on the design of distributed database systems.

c) (6 Marks) Explain why a traditional RDBMS fails in serving today's rapidly growing database requirements.

7.

a) (7 Marks) "Various **distributed database** systems have been developed for handheld devices like PDAs and handheld PCs". Based on what characteristics of those light-weighted databases would you justify the above statement?

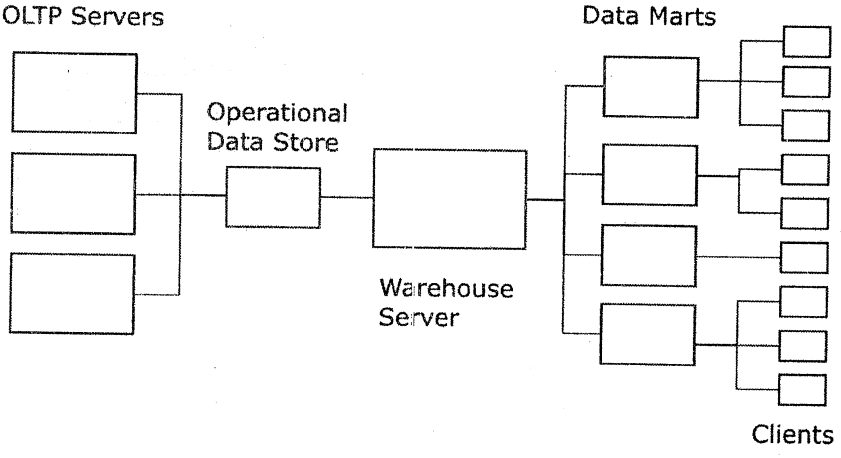
b) (6 Marks) Briefly explain why popular DBMSs support XML?

c) (7 Marks) Explain how triggers and stored procedures support to enforce integrity rules in a DBMS.

8.

a) (4 Marks) State why operational databases are not primarily suited for decision support applications?

b) (10 Marks) Following figure shows the typical business intelligence topology. Briefly explain the functionalities of each entity in relation to data warehousing and data mining.



c) (6 Marks) The biggest issue faced by users of multiple identical or similar databases is how to keep the data on all of the servers synchronised as the data is changed over time. As a user inserts, updates, or deletes data on one database, you need to have some way to get these new changes to the other databases. Briefly describe one of the facilities available in a DBMS to take this burden out of you.