NAPIER UNIVERSITY
SCHOOL OF COMPUTING

RESIT DIET - SESSION 2001-02

DATABASE SYSTEMS

MODULE NO: CO22001

DATE: AUG 2002

EXAM TIME: 1½ HOURS

START TIME: HOURS

FINISH TIME: HOURS

EXAMINERS:
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QUESTION PAPER DATA

Number of pages –
Number of questions – 5

INSTRUCTIONS TO CANDIDATES

Select any 3 questions from 5.

Question 1:

Consider the following:

A Bank needs to hold business data in a database. This consists of business account details. Business accounts have an account number and business name. Each business has an account manager, who is a member of the banking staff, and has a staff number and a name. An account manager can be in charge of multiple accounts, and every account must have a manager. Each account also has transaction record, which consists of a date when the transaction was entered and an amount in Dollars. If the amount is a positive number then the transaction is a deposit, otherwise it is a debit.

a) Produce an ER diagram for this specification.

Mark: 5

b) Now consider that the bank wants to add in Personal Accounts in to the database. Personal accounts do not have a Business manager, but do have transactions in the same way as business accounts.

Redraw the ER diagram with both Personal and Business accounts.

Mark: 10

c) Map the ER diagram produced in (a) into relations.

Mark: 10

Total Marks: 25

Question 2:

Consider the following transaction schedule which is executed in a DBMS which lacks any type of locking.

Time	Transaction A	Transaction B	Transaction C
T1	**READ(j)**		
T2		**READ(k)**	
T3			**READ(l)**
T4			**READ(k)**
T5			**k:=k+l**
T6		**READ(j)**	
T7			**WRITE(k)**
T8			**COMMIT**
T9		**j:=j+k**	
T10		**WRITE(j)**	
T11		**COMMIT**	
T12	**READ(l)**		
T13	**l:=l+j**		
T14	**WRITE(l)**		
T15	**COMMIT**		

a)

(i) Explain the A.C.I.D. model for transactions.

Mark: 4

(ii) Discuss the need for two-phase locking, in comparison with a system which lacks any type of locking model.

Mark: 5

b)

(i) Convert the above transaction schedule to a schedule which would result if the DBMS system used made use of two-phase locking.

Mark:10

(ii) Explain in words why the given transaction schedule deadlocks.

Mark:2

c) Discuss how deadlock can be detected and rectified in a DBMS.

Mark: 4

Total Marks: 25

Question 3:

Consider the following actions which are to be performed as part of a single transaction

Transaction A
k:=k+1
i:=i+4
j=j+1
ABORT

a) Discuss why recovery mechanisms are needed in a DBMS.

Mark: 5

b) Using the schedule shown above, describe the process of DEFERRED UPDATE. Use diagrams to assist your describtion.

Mark: 12

c) Critically compare the process of DEFERRED UPDATE to IMMEDIATE UPDATE.

Mark: 8

Total Marks: 25

Question 4:

Consider the following relation
R(a,b,c,d,(e,f,g))
where
a,e -> f
c,d -> b
e -> g

a) Discuss why normalisation is a useful process in database design.

Mark: 5

b)

i) What level of normalisation is the relation R currently in?

Mark: 2

ii) Normalise R to BCNF and show all working.

Mark: 14

c) Comment on where you might not want to normalise a database.

Mark: 4

Total Marks: 25

Question 5:

Relation X

V	W
1	4
2	4
3	2
4	1
5	1

Relation Y

K	L
1	2
2	5
4	2
6	1
7	3

(a) Explain what the CARTESIAN PRODUCT means.

Mark: 4

(b) Consider the following SQL

```
SELECT V,L
FROM X,Y
WHERE V = K
```

What would be the output of this query?

Mark: 6

(c)

(i) Taking the same SQL query as in (b), produce relational algebra which is equivalent to the SQL.

Mark: 10

(ii) Discuss how SQL can be made to execute more efficiently by mapping the SQL to relational algebra within the DBMS before it is executed.

Mark: 5

Total Marks: 25

END OF PAPER