NAPIER UNIVERSITY
SCHOOL OF COMPUTING

RESIT DIET (MALASIA) - SESSION 2001-02

DATABASE SYSTEMS

MODULE NO: CO22001

DATE: JAN 2002

EXAM TIME: 1½ HOURS

START TIME: HOURS
FINISH TIME: HOURS

EXAMINERS:
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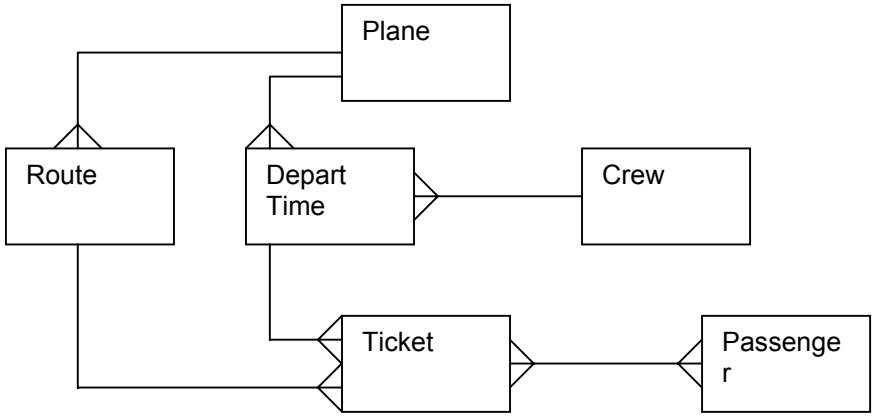
QUESTION PAPER DATA

Number of pages – 5
Number of questions – 5

INSTRUCTIONS TO CANDIDATES
Select any 3 questions from 5.

Question 1:

Consider the following ER diagram.



a) Answer the following questions and give reasons for your answer.

(i) How many crew can be on a plane?

Marks: 3

(ii) How many routes can one ticket cover a passenger for?

Marks: 2

b) If CREW contained the name and address of crew members, and PASSENGER contained the name and address of passengers, how could we have crew flying as a passenger while still having a normalised database?

Marks: 8

c) Given the following attributes, produce relations for the database.

PLANE(registration,colour,age)
ROUTE(route_id,distance)
DEPARTURE_TIME(year,day,month,hour,minute)
CREW(crewid,name,address)
PASSENGER(passenger,name,address)
TICKET()

Marks: 12

Total Marks: 25

Question 2:

Consider the following transaction schedule running in a system without locking.

Time	Transaction A (Withdraw)	Transaction B	Transaction C
T0			READ(j)
T1	READ(i)		
T2		READ(i)	
T3		i := i * 1.05	
T4	i := i – 100		
T5	WRITE(i)		
T6	COMMIT		
T7		WRITE(i)	
T8		COMMIT	
T9			READ(i)
T10			i := i + 50
T11			j := j - 50
T12			WRITE(i)
T13			WRITE(j)
T14			COMMIT

(a) What is meant by serialisability?

Mark: 4

(b)

(i) Produce a precedence graph for the transaction schedule.

Mark: 12

(ii) Is the schedule serialised?

Mark: 2

(c) If an attempt was made to follow the schedule in a DBMS with two-phase read and write locking, redraw he schedule which would actually occur. If more than one possible schedule could occur you need only draw one of the possibilities.

Mark: 7
Total Marks: 25

Question 3:

(a) The Database Administrator (DBA) is involved in the overall design process for new or evolving DBMS implementations. Discuss this process with particular reference to the ANSI/SPARC three level architecture and the Database Analysis Life Cycle.

Mark: 15

(b) The DBA controls the security aspects of the DBMS implementation. Discuss the software and hardware controls available to the DBA, and how this could fit into a commercial environment.

Mark: 10

Total Marks: 25

Question 4:

Consider the following relation
R(u,v,w,x,y,z)
where
w,v -> z
y->x
x->u

a) Comment on the differences between normalisation to 3NF and BCNF.

Mark: 5

b)

i) What normal form is the relation R currently in?

Mark: 2

ii) Normalise R to BCNF and show all working.

Mark: 14

c) Comment on what impact normalisation can have on performance and disk usage for a DBMS.

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