



UNIVERSITY of LIMERICK

OLLSCOIL LUIMNIGH

COLLEGE of INFORMATICS and ELECTRONICS
Department of Computer Science and Information Systems

End-of-Semester Exam

Academic Year:	2006/2007	Semester:	Spring
Module Title:	Database Systems	Module Code:	CS4416 and CS5122
Exam Duration:	2½ Hours	Total Marks:	65
Lecturer:	Dr. N. S. Nikolov		

Instructions to Candidates:

Answer ALL questions!

Please write **ALL** answers in the answer booklet.
State clearly any assumptions you make.

SECTION A – SCHEMA DESIGN

Q1. (12 marks) The E/R diagram in Fig. 1 describes a database about bands and their tours. A tour consists of a sequence of towns visited by a band. We assume that no town is visited twice on a single tour, and on one date, a band can visit only one town. Some of the entity sets are weak, and some of the relationships are supporting many-one relationships, but all double rectangles and double diamonds are not shown. Assume that tours of different bands can have the same number (i.e. tourNumber).

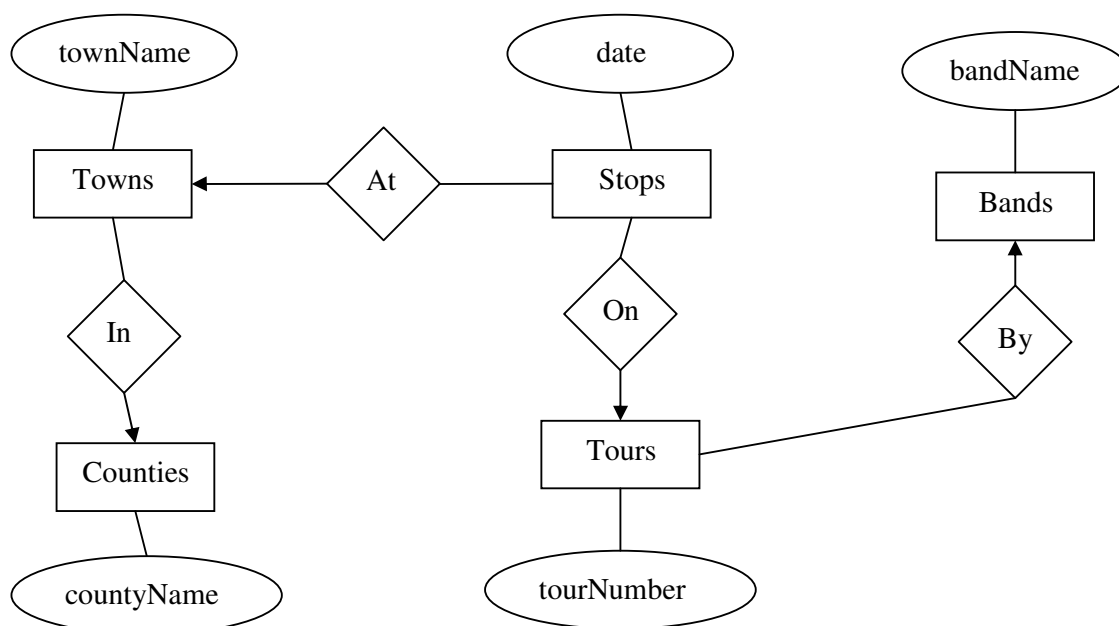


Figure 1

- a. (7 marks) Redraw the diagram in Fig. 1 with showing which of the entity sets are weak, and which relationships support them. If there is a choice, prefer to use the attributes of the entity set itself in the key, and minimize the number of supporting relationships.
- b. (5 marks) Represent the diagram in Fig. 1 with one or more relation schemas and briefly explain your decision.

Q2. (5 marks) Find all keys of the relation R(ABCDEFG) with functional dependencies

$AE \rightarrow C$, $CD \rightarrow B$, $BF \rightarrow G$, $FG \rightarrow B$, $BD \rightarrow C$, and $CE \rightarrow A$

Q3. (5 marks) Which one of the following five relations is in Third normal form (3NF)?

- a. R(ABCD) FD's: $B \rightarrow C$; $AC \rightarrow D$; $ABD \rightarrow C$; $BCD \rightarrow A$
- b. R(ABCD) FD's: $C \rightarrow B$; $A \rightarrow B$; $CD \rightarrow A$; $BCD \rightarrow A$
- c. R(ABCD) FD's: $ABD \rightarrow C$; $CD \rightarrow A$; $AC \rightarrow B$; $AC \rightarrow D$
- d. R(ABCD) FD's: $AB \rightarrow C$; $ABD \rightarrow C$; $ABC \rightarrow D$; $AC \rightarrow D$
- e. R(ABCD) FD's: $AB \rightarrow C$; $BCD \rightarrow A$; $D \rightarrow A$; $B \rightarrow C$

SECTION B – SQL

GamesA

Team	Opponent	Goals_Scored	Goals_Against
Dragons	Tigers	5	3
Carp	Swallows	4	6
Bay Stars	Giants	2	1
Marines	Hawks	5	3
Ham Fighters	Buffaloes	1	6
Lions	Golden Eagles	8	12
Tigers	Dragons	3	5
Swallows	Carp	6	4
Giants	Bay Stars	1	2
Hawks	Marines	3	5
Buffaloes	Ham Fighters	6	1
Golden Eagles	Lions	12	8

GamesB

Team	Day	Opponent	Goals_Scored
Dragons	Sunday	Swallows	4
Tigers	Sunday	Bay Stars	9
Carp	Sunday	Giants	2
Swallows	Sunday	Dragons	7
Bay Stars	Sunday	Tigers	2
Giants	Sunday	Carp	4
Dragons	Monday	Carp	6
Tigers	Monday	Bay Stars	5
Carp	Monday	Dragons	3
Swallows	Monday	Giants	0
Bay Stars	Monday	Tigers	7
Giants	Monday	Swallows	5

Figure 2

Q4. (23 marks) Consider the two relations GamesA and GamesB shown in Fig. 2. Write SQL queries which ask for:

- a. (5 marks) The list of all teams in GamesA which are winners and for each winner the total number of goals scored in that game.
- b. (6 marks) The list teams from GamesB which scored in every game they played and the average number of goals scored by each team.
- c. (6 marks) Pairs of teams from GamesA that either scored the same number of goals or had the same number of goals scored against them, or both. The output must list the teams with the first preceding the second alphabetically.
- d. (6 marks) The Team/Day pairs from GamesB such that the team scored the minimum number of goals for that day, and the team is a winner in GamesA.

Q5. (8 marks) Consider the following SQL trigger on relation R(a,b):

```
CREATE TRIGGER T
AFTER INSERT ON R
REFERENCING NEW ROW AS Newtuple
FOR EACH ROW
WHEN(Newtuple.a * Newtuple.b > 10)
INSERT INTO R VALUES(Newtuple.a - 1, Newtuple.b + 1);
```

When we insert a tuple into R, the trigger may cause another tuple to be inserted, which may cause yet another tuple to be inserted, and so on, until finally a tuple is inserted that does not cause the trigger to fire. Describe the behaviour of this trigger if the tuple (3,5) is inserted into R(a,b).

SECTION C – PL/SQL

Consider the relation schema Sells(shop, item, price).

Q6. (6 marks) Write a PL/SQL procedure Update(x , y , z) that adds the item y to shop x at price z in relation Sells.

Q7. (6 marks) Write the PL/SQL procedure PriceUp(x) which sends a cursor through the relation Sells, and raises by 1.00 the price of each item sold by shop x , if that price was initially under 3.00.

END OF EXAM
