UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

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

End-of-Semester Exam

Academic Year:	2007/2008	**Semester:** Spring	
Module Title:	Database Systems	**Module Code:** CS4416 and CS5122	
Exam Duration:	2½ Hours	**Total Marks:** 65 (65% of the final grade)	
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. **(10 marks)**

The E/R diagram in Fig. 1 describes a database which stores details about bands and their tours. A tour consists of stops in different towns on different dates. Each tour also has a unique tourNumber. We assume that on a particular date, a band can stop only in one town. Some of the entity sets in the diagram below should be marked as weak, and some of the relationships as supporting relationships, but all double rectangles and double diamonds are not shown.

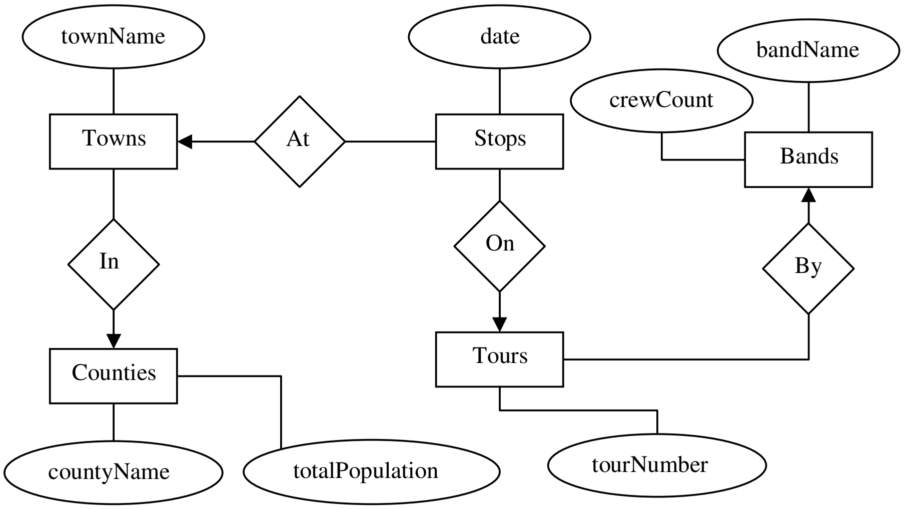

Figure 1

a. **(5 marks)** Redraw the diagram in Fig. 1 with showing which of the entity sets are weak, and which relationships support them. If alternative solutions are possible choose only one and explain your assumptions. Underline all key attributes.

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 relation R(ABCDEFG) with functional dependencies

BF → G, FG → B, BD → E, CE → A, AC → E, and DE → B

Q3. (10 marks)

Which one of the two relations below is in Third normal form (3NF)? Explain why. Decompose the relation which is not in 3NF to an equivalent group of relations which are in 3NF.

R(ABCD) FD's: B → C ; AC → D ; ABD → C ; BCD → A
S(ABCD) FD's: ABD → C ; CD → A ; AC → B ; AC → D

SECTION B – Queries and PL/SQL

Q4. (20 marks)

Consider the two relations **GamesA** and **GamesB** shown in Fig. 2. Write SQL queries which find:

a. **(4 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. **(4 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)** The list of teams for which their Goals_Scored in GamesA is larger than their average Goal_Scored in GamesB.

d. **(6 marks)** The (Team,Opponent) pairs from GamesB such that Team scored the maximum number of goals for that day, and Opponent is a winner as a Team in GamesA.

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

Q5. (5 marks)

Consider relation ***R*(*a*,*b*)**, where *a* and *b* are numbers, and the following SQL trigger:

```
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 (4,3) is inserted into *R*(*a*,*b*).

Q6. (15 marks)

Consider relation **Sells(shop, item, price)**.

a. **(5 marks)** Write a PSM (or PL/SQL) procedure Update(x, y, z) that adds the item *y* to shop *x* at price z in relation Sells.

b. **(10 marks)** Write a PSM (or PL/SQL) procedure PriceDown(*x*) which subtracts 1.00 from the price of each item in relation **Sells** which is sold by shop *x*, if its price was above 5.00.

Hint: Use a cursor.

END OF EXAM