UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

COLLEGE *of* INFORMATICS *and* ELECTRONICS

Department of Computer Science
and Information Systems

**End-of-Semester Assessment Paper**

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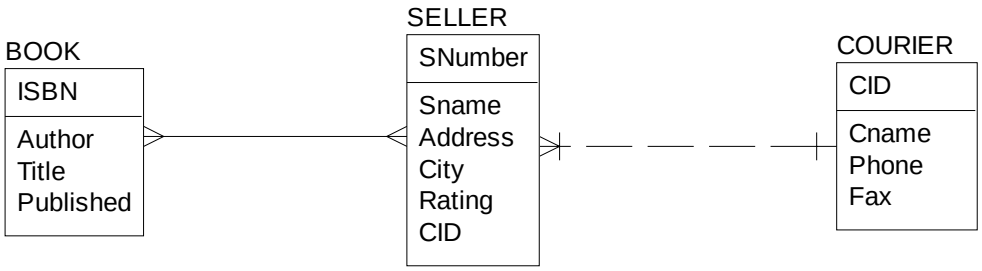
| Academic Year: | **2005/06** | Semester: | **Semester 1** |
| Module Title: | **Introduction to Systems Analysis** | Module Code: | **CS4513** |
| Duration of Exam: | **2½ Hours** | Percent of Total Marks: | **82** |
| Lecturer(s): | **Norah Power** | Paper marked out of : | **100** |

**Instructions to Candidates:**

- **Please attempt all 10 questions.** They are all related and are best answered in the order in which they are presented.
- **Leave space between your answers, in case you need to revise or correct anything later.**

## *Bookselling System*

*The E-R diagram represents a website that offers books for sale. The price of a book varies, depending on the seller. A seller may have more than one copy of a book and each copy will have a different price. Each book has a publication date, and each seller has a rating. Other attributes are shown in the E-R diagram. Typical values of the Attributes are indicated in Questions 4 - 10.*




Q1
Convert the Many-to-Many relationship shown in the ER diagram into an entity. Name the entity and show its attributes. Indicate the identifying attribute(s) of this entity.

[8 Marks]

Q2
Write the Z record schemas for the Relations implied by the E-R diagram and the description above, consistent with your answers to Q1.
All your **Domains** should be declared beforehand.

[10 marks]

Q3
(a) Write the State schema in Z for the Bookselling System database. Include the existential and referential integrity constraints.

(b) Write the referential integrity constraints in SQL.

[15 marks]

Q4
Write **Relational Algebra** operations for the following queries. Use union or intersection operations where needed. Do not use ‘and’ or ‘or’ or any similar keywords.

i) List the phone number and Fax number of each Courier, along with the Id
ii) Get the details of all sellers based in London who have ratings greater than 3
iii) Name all the sellers and all the authors
iv) List the Ids of couriers that are used by seller S2256
v) For each book published before 1997, list the ISBN and Author.

[15 marks]

Q5
Write **Relational Calculus** expressions for the (3) odd-numbered queries in Q4

[6 marks]

Q6

Write **Relational Calculus** expressions for the following queries:

i) How many sellers currently have books for sale in the system?
ii) How many sellers are there for the Book identified by 0 903981 11 4?
iii) Name the seller identified by S3356
iv) What is the rating of each seller who is selling one or more copies of the book 0 903981 11 4?
v) List the authors sold by the seller named Brian Eno.

[15 marks]

Q7

Re-write the (2) even-numbered queries in Q6 in **SQL**

[4 marks]

Q8

Express the following queries as **SQL** statements:
(Please write each clause on a separate line.)

i) Get the name and phone of each courier used by sellers with a rating of 5. Do this using a **subquery**.
ii) Get the name and phone of each courier used by sellers with a rating of 5. Do this **without** a subquery
iii) Get the full details of each book that has the most copies available.
iv) Get the full details of each book that is the cheapest offered for sale by each seller

[9 marks]

Q9

Write a Z operation schema to add a new copy of a book to the database. There are already two copies of it for sale. This copy is a copy of book **b?** and is offered by seller **s?** at a price of **m?** The seller must already exist.

[12 marks]

Q10

Write a Z schema for an operation that tries to insert the details of a new Seller into the database; the operation will be unsuccessful because the Id of the new seller is ‘Already there’.

[6 marks]