UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

COLLEGE *of* INFORMATICS *and* ELECTRONICS

Department of Computer Science
and Information Systems

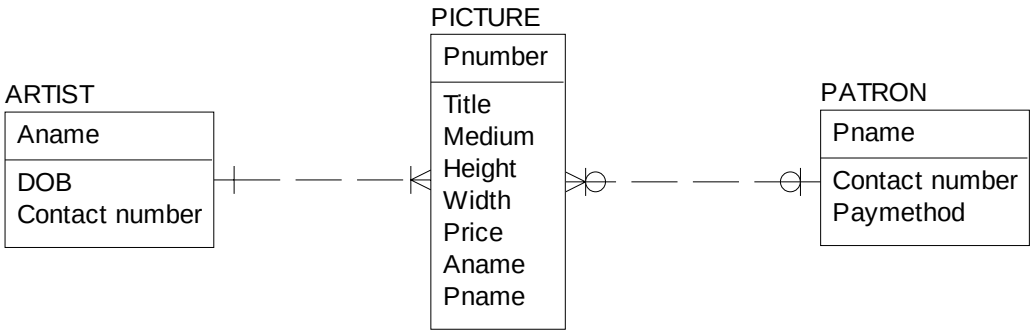
End-of-Semester Assessment Paper

Academic Year:	**2007/08**	Semester:	**Semester 1**
Module Title:	**Introduction to Systems Analysis**	Module Code:	**CS4513**
Duration of Exam:	**2½ Hours**	Percent of Total Marks:	**80**
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.**

The E-R diagram represents a system that will be used by a Gallery for a forthcoming art exhibition. The artist's date of birth (DOB) is stored along with his or her contact number. The medium of a picture states whether it is in Oils, Watercolour, Acrylic, Gouache, etc. The payment method used by the Patron who buys pictures may be Cash, Cheque or Credit Card. Other attributes are shown in the E-R diagram. Typical values of the Attributes are indicated in Questions 4 - 10.



Q1
Using examples, explain the notation used to represent the relationships in the diagram above.

[5 Marks]

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

[8 marks]

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

(b) Write the referential integrity constraints in SQL.

[12 marks]

Q4
Write **Relational Algebra** operations for the following queries, using Union or Intersection operations where needed.

i) List all the contact numbers
ii) List the titles of pictures bought by patrons called Keenan
iii) List the height and width of each picture painted by Corcoran
iv) List the area of each picture bought by Keenan
v) What is the contact number of each patron who bought a watercolour?

[15 marks]

Q5
Write **Relational Calculus** expressions for the three odd-numbered queries in Q4

[6 marks]

Q6

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

i) How many patrons pay by cheque?

ii) For each picture sold list the artist's contact number along with the title and the contact number of the buyer

iii) How many watercolours have been paid for by cash buyers?

iv) List the name and contact number of every patron who paid more than €500 Euro for a watercolour

v) Calculate the area of each picture painted by the artist called Marrinan. Include the title in the output.

[10 marks]

Q7

Re-write the two even-numbered queries in Q6 as SQL views

[4 marks]

Q8

Express the following queries in SQL, writing each clause on a separate line.

i) What is the minimum, average and maximum price of the pictures that have not been sold?

ii) What is the highest price for a picture in each medium?

iii) What is the name and DOB of the artist who has sold the most pictures?

iv) Name the oldest artist in each medium.

[20 marks]

Q9

Write an operation schema to insert into the database a tuple **p?** representing a new picture. Check that the artist already exists.

[10 marks]

Q10

Write an operation schema to delete from the database the Artist identified by the domain variable **a?** which also deletes all the pictures that he has **not yet sold**.
Write the SQL code for the deletion.

[10 marks]