UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

COLLEGE *of* INFORMATICS *and* ELECTRONICS

Department of Computer Science
and Information Systems

End-of-Semester Assessment Paper

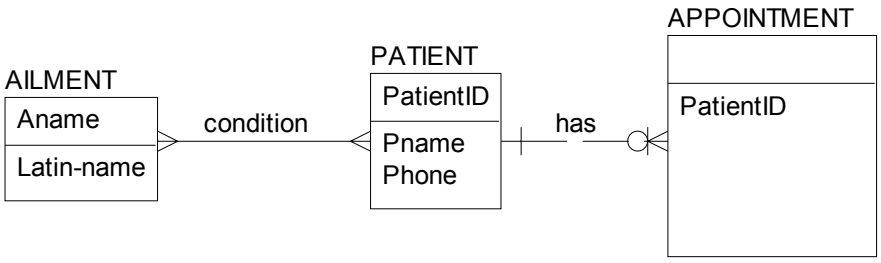
Academic Year:	**2004/05**	Semester:	**Semester 1**
Module Title:	**Introduction to Systems Analysis**	Module Code:	**CS4513**
Duration of Exam:	**2½ Hours**	Percent of Total Marks:	**82**
Lecturer(s):	**Norah Power**	Paper marked out of :	**100**

Instructions to Candidates:

- **Please attempt all 10 questions.** They are all related and are best answered in the order in which they are presented.

Clinic Appointment System

Patients come to the clinic to obtain treatment for their ailments, such as Allergies, Arthritis, Backache, Fatigue, etc. Each appointment is for an individual patient to see a particular therapist, at a given time, on a given date, for specific treatment, such as Reflexology, Homeopathy, etc. Therapists are represented by their surnames. The clinic has ten rooms, identified by room number. The length of time (in months) a patient has had a particular ailment is also of interest. Other attributes are shown in the E-R diagram.



Q1
(a) List the attributes of the Entity APPOINTMENT. Choose an identifier for this entity from these attributes. [Don't use AppointmentID, but a combination of the attributes that are suggested in the description above.]

(b) What are the attributes of the Many-to-Many relationship shown in the ER diagram above? What is the identifier of this relationship?

[7 Marks]

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

[10 marks]

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

[16 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 name and phone number of each patient
ii) List the names of all the patients and all the therapists
iii) Get the names of therapists who have appointments in room number 9
iv) The Ids of patients who have had Arthritis for more than 6 months
v) For each appointment on the 6th January 2005, list the name of the therapist and room number.

[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 patients have Arthritis?
ii) How many appointments are for Reflexology?
iii) What is the phone number of each Backache patient?
iv) Make a list of Patient Ids with the Latin names of their ailments.
v) What is the name and address of each patient who has/had an appointment with the therapist named Jones?

[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 a list of pairs of names: each pair consists of a patient name and the name of a therapist that he or she had an appointment with before the 2nd of January 2005.
ii) For each therapist who has had more than four patients before the 31st January 2004, list how many patients he or she has treated.
iii) What is the most usual treatment given to patients?

[9 marks]

Q9
Write an operation schema to delete all appointments for a particular therapist identified by **t?**. The operation must also output a list of the affected patients along with their phone numbers.

[9 marks]

Q10
Write an operation schema to insert into the database a new patient represented by **p?** and a set of related facts **C?** about the ailments he has. All his ailments must already exist in the database.

[9 marks]