

UNIVERSITY OF CENTRAL LANCASHIRE

FACULTY OF SCIENCE AND TECHNOLOGY

SCHOOL OF COMPUTING, ENGINEERING AND PHYSICAL SCIENCES

Examination

MODULE CODE: CO2755

MODULE TITLE: Database Systems

SEMESTER 2, 2012

Instructions to Candidates:

Answer ALL questions from Section A (25% of the marks)

Answer THREE questions from Section B (75% of the marks)

Additional materials: None

Time Allowed: 2 hours + 10 minutes reading time

Date:

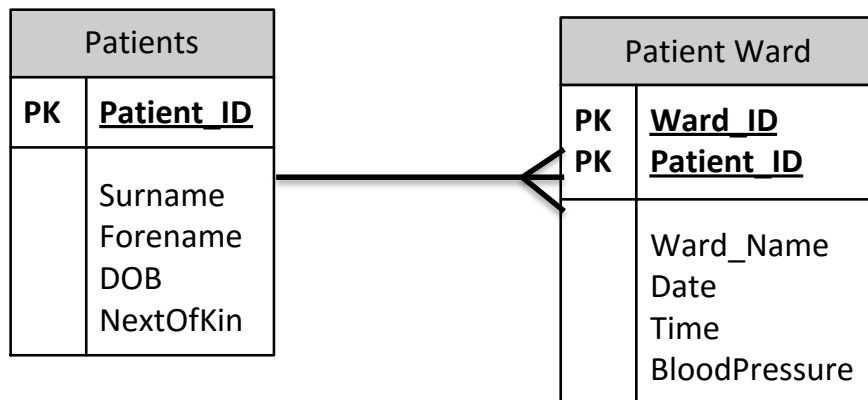
Time:

Venue:

Section A

Answer all the questions in this section

1. Define the terms **primary key** and **composite key** (also known as compound/complex or concatenated key). For each term give an example of their use in a table **(4 marks)**
2. Explain the purpose of prototyping and distinguish between requirements prototyping and evolutionary prototyping. **(4 marks)**
3.
 - a. Give a definition of second normal form. **(2 marks)**
 - b. The following entities relate to a Patients Records System at a hospital. Given that the entities shown are in 1NF, put them into 2NF and justify your actions.



(5 marks)

(Question total 7 marks)

4. With any computer system there are many issues of security that need to be considered.
 - a. Discuss what do you understand by the term **security** in relation to computer systems? **(2 marks)**
 - b. Discuss 4 different security measures which could be considered for any multiuser computer system. **(8 marks)**
- (Question total 10 marks)**

Section B

Answer 3 out of 4 questions in this section.

5. McLaren Excursions is a small company offering coach excursions to places of interest throughout the region. The company stores data about its excursions such as the destination, date, departure and arrival times. It also keeps information about bookings such as the date an excursion is booked, the number of tickets sold per booking. In addition the name of the passenger and whether or not the passenger is the party leader is recorded against each ticket allocation

- a. Draw an entity relationship diagram (logical data model) representing the data in above the system. State any assumptions which you make.
(9 marks)
- b. Relationships have ***cardinality*** and ***optionality***. Explain what you understand by the terms in italics
(4 marks)
- c. List 5 different data types that could be used in a database system, giving examples of where you would use each of the data types identified in the ERD you created in part a).
(5 marks)
- d. Explain what is meant by the term ***validation***. Using 3 different validation methods, explain the validation that could be performed on 3 of the attributes identified in part a

(7 marks)

(Question total 25 marks)

6. Relational databases are well established and used in a variety of business environments. However, users are now demanding more sophisticated database systems driven by advances in technology such as Geographical Information Systems (GIS), mobile databases, object oriented, multi-media and intelligent databases.

- a. Describe an advanced database system you have studied, justifying the use of the term 'advanced'
(10 marks)
- b. Discuss the tasks users typically undertake when using the system and describe the features the system provides to support the user.

(15 marks)

(Total 25 marks)

7. A database system for a modern gym holds details of members' activities on aerobic equipment (e.g. Treadmill, Cross-trainer, Rowing Machine etc.) Members scan their membership cards on card readers on the gym equipment type. Information about the activity type and duration along with the equipment settings is captured and recorded against the member. The database consists of the following 2 tables:

Members

Member_id	Primary key, integer
Forename	Text
Surname	Text
Address1	Text
Address2	Text
Address3	Text
Post_code	Text – with input mask
Telephone	Text – with input mask
Email	Text
Renewal_Date	Date

Activities

Activity_ID	Primary key, integer
Member_id	Foreign key, integer
Activity_date	Date
Start_Time	Date/Time
End_time	Date/Time
Activity_Name	Text
Activity_Details	Text

The relationship between the tables is described as:

Each Member may partake in any activity more than once per visit
Each activity must relate to one and only one Member

Write appropriate SQL commands to generate results for the following queries:

- A complete list of all activities in reverse date sequence. (Most recent first) **(3 marks)**
- An list of Members showing Membership id, forename, surname, and email address only, in alphabetical order of customer surname. **(3 marks)**
- A list showing Membership id, surname, forename, activity date, start time, end time, activity name and activity details for the member whose id is 100184002. **(5 marks)**

d. A list showing all the details of all the activities on the Rowing Machines only (3 marks)

e. A list showing the membership id, forename and surname of all those whose membership renewal date is in June 2012 the list should be in alphabetical order of surname (6 marks)

a. A new member is to be added to the system with the following partial details

Member id 100212399
Forename John
Surname Smith

(5 marks)
(Total 25 marks)

8. a. A multi-user database must guard against problems of concurrency and will use data locks in order to resolve these issues.

(i) Explain what is meant by the term **concurrency** in this context, using an example to aid your explanation. (5 marks)

(ii) How can data locks be used to resolve these concurrency issues, include in this explanation your understanding of the term granularity. (5 marks)

(iii) In this context explain what is meant by a **dirty read** (2 marks)

b. In the context of databases what is a transaction and what is its importance when updating a database? (3 marks)

c. As a result of applying data locks, deadlock or deadly embrace can become an issue.

(i) What is meant by the term **deadlock** or **deadly embrace**? Use an example to illustrate your answer. (5 marks)

(ii) Describe the method of two phase locking which could be used to overcome deadlock. (5 marks)

(Question total 25 marks)