UNIVERSITY EXAMINATIONS
EXAMINATION FOR SEPTEMBER/DECEMBER 2015/2016 FOR
BACHELOR OF SCIENCE IN COMPUTER SCIENCE
RCCS 207   DATABASE SYSTEMS

DATE: 8TH December 2015.   TIME: 2 HOURS

GENERAL INSTRUCTIONS:
Students are NOT permitted to write on the examination paper during reading time.
This is a closed book examination. Text book/Reference books/notes are not
permitted.

SPECIAL INSTRUCTIONS:
This examination paper consists Questions in Section A followed by section B.
Answer **Question 1 and any Other Two** questions.
QUESTIONS in ALL Sections should be answered in answer booklet(s).

1. **PLEASE start the answer to EACH question on a NEW PAGE. You will lose 5 MARKS if this is not done.**
2. **Keep your phone(s) switched off at the front of the examination room and NOT on your person.**
3. **Keep ALL bags and caps at the front of the examination room and DO NOT refer to ANY unauthorized material before or during the course of the examination.**
4. **ALWAYS show your working.**
5. **Marks indicated in parenthesis i.e. ( ) will be awarded for clear and logical answers.**
6. **Write your REGISTRATION No. clearly on the answer booklet(s).**
7. **For the Questions , write the number of the question on the answer booklet(s) in the order you answered them.**
8. **DO NOT use your PHONE as a CALCULATOR .**
9. **YOU are ONLY ALLOWED to leave the exam room 30minutes to the end of the Exam.**

SECTION A (COMPULSORY)
QUESTION 1 (COMPULSORY, 30 MARKS).

(a) Explain three techniques that can be used to recover data after a database failure
(6 marks)

(b) Draw an E-R diagram (including attributes, identifiers and mandatory/optional cardinality) for the following system description, stating any assumptions that you make.
A marketing company has several branches located throughout the Country. Each branch has several marketing employees, one of whom is employed as the branch manager. Each branch is responsible for a group of contracted marketing projects, and any number of the employees, possibly in different branches, may work on a contracted marketing project. It is also likely that an employee could be working on many contracted marketing projects at a time, and indeed could work on the same contracted marketing project at different points during the project's lifetime (which could span several months). A contracted marketing project will involve the development of one or more marketing events, which currently relate to one of four media alternatives - TV,
radio, newspaper or the Internet. It is likely that the number of media alternatives will increase over time, as new media channels emerge, e.g. interactive TV, wifi , etc.
(10 marks)

(c) Explain the four desirable characteristics of a transaction   **(8 marks)**

(d) During database design and implementation some languages are used. Explain the languages giving relevant examples of how they are applied in the process   **(6 marks)**

SECTION B (OPTIONAL 2 OUT OF 4)

QUESTION 2   (20 MARKS)
(a) In the context of the relational database design:
    (i) Define **normalisation**.   **(2 marks)**
    (ii) Describe the steps involved in normalisation up to and including third normal
       form (3NF).   **(6 marks)**
(b) Consider the following relation:
    OrderItem (OrderNo, ItemCode, Quantity, OrderDate, Description, CustomerNo,
    CreditLimit, DeliveryAddress)
    The following Functional Dependencies (FDs) apply to OrderItem:
    FD1 OrderNo, ItemCode -> Quantity
    FD2 OrderNo, ItemCode -> OrderDate
    FD3 ItemCode -> Description
    FD4 OrderNo -> CustomerNo
    FD5 CustomerNo -> CreditLimit
    FD6 CustomerNo -> DeliveryAddress
  (i) Define the **two** Transitive Dependencies that can be derived from the FDs and give an explanation of the derivation.   **(4 marks)**
  (ii) Given the FDs above, normalise the OrderItem to 3NF, carefully showing your intermediate steps.   **(8 marks)**

QUESTION 3 (20 MARKS)

The following tables represent information on a concert season, the performers who will be playing at the concerts and details of which concerts each performer is performing in.

Concert

Concert No	Title	Date
C01	Summer Melodies	21/6/04
C02	Winter Studies	23/6/04
C03	Handel Evening	3/7/04
C04	French Composers	30/6/04

Performance

Concert No	Performer No	No of Pieces
C01	P05	2
C01	P03	1
C01	P04	3
C02	P01	5
C02	P02	2
C02	P04	4
C03	P01	3
C04	P03	2
C04	P04	1

Performer

Performer No	Name	Instrument
P01	Allen	Violin
P02	Wade	Cello
P03	Patel	Flute
P04	Matthews	Cello
P05	Lee	Oboe

(a) Write the SQL for the following queries.
   (i) List the names of all cello players. **(3 marks)**
   (ii) List the names of all performers who are playing more than three pieces at any concert. **(4 marks)**
   (iii) List the names of all concerts in which Matthews is performing. **(6 marks)**
   (iv) List all the concerts that took place before the July 2004 **(3 marks)**
(b) Write the SQL for the following operations.
   (i) Inserting a record into the concert table **(4 marks)**

QUESTION 4 (20 MARKS)

(a) Explain the ANSI-SPARC three level architecture and the role played by the three levels. **(6 Marks)**

(b) Briefly describe the difference between a database and a database management system. **(4 Marks)**

(c) Explain the advantages of a Database Management system (DBMS) **(10 Marks)**

QUESTION 5 (20 MARKS)

(a)   Explain five types of threats that databases are normally exposed to
   (10 Marks)

(b)   Draw an E-R diagram (including attributes, identifiers and
      mandatory/optional cardinality) for the following system description, stating
      any assumptions you make.

      A software company keeps details of the computer systems that it develops.
      Each system is given a unique number, a description and a scheduled
      completion date. The development of each system is divided into a number of
      tasks, each of which is allocated a task number (which is only unique within a
      system), a description and a budget. The company employs a number of
      programmers to work on tasks. Each programmer has an employee number
      and a name. A programmer is assigned to a number of tasks and some tasks
      have more than one programmer assigned to them. When a programmer is
      allocated to a task, they are given a number of days to complete that task.

      (10 marks)