THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. DEGREE PROGRAMME: LEVEL 05
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
FINAL EXAMINATION: 2011/2012
CSU3278: DATABASE MANAGEMENT SYSTEMS

DURATION: THREE HOURS (3 HOURS)

Date: 16th June 2012   Time: 9.30am - 12.30pm

Answer FOUR (04) questions only.

QUESTION 01

a) Explain the difference between **data** and **information**. Why is it important to have good data?

b) What is a data dictionary, what does it contain, and how is it used?

c) Compare and contrast the file-oriented approach and the database approach. Explain the main advantages of database systems.

d) Contrast the logical and the physical view of data and discuss why separate views are necessary in database applications. Describe which perspective is most useful for each of the following employees: a **programmer, a manager,** and **an internal auditor.** How will the understanding of logical data structures assist you when designing and using database systems?

e) What are the three data anomalies that are likely to occur as a result of data redundancy? Can data redundancy be completely eliminated in the database approach? Why or why not?

QUESTION 02

a) Define the following terms. Give an example for each.

    i. Strong entity.

    ii. Weak entity.

b) The organizing committee of the Annual Academic Sessions of the Open University of Sri Lanka has decided to introduce an online paper submission system. The following description explains the requirements of the proposed system.

Description

Papers can be submitted by the authors from any university in the country. A paper has a paper_id, title and session, and an author has an author_id, name, title, university, faculty and email. The paper_id and author_id uniquely identify a paper and an author respectively. After the deadline of the paper submission, papers are reviewed by reviewers and comments (modifications to be made on the paper) are sent. The reviewers are uniquely identified by their id. Further, reviewers have a title, name and a faculty. Reviewers can give any number of comments but the length of the comment should not exceed 255 characters. Once the reviewer's comments are received the modifications are made by the author. Then papers are edited by the faculty editors (editor has editor_id, title, name and faculty and editor_id is unique) and the final versions are submitted. On the day of the Annual Academic Sessions papers will be presented in one of the sessions. A separate session will be allocated for each faculty.

Clearly mentioning the assumptions you made, draw a complete ER diagram to satisfy the above description.
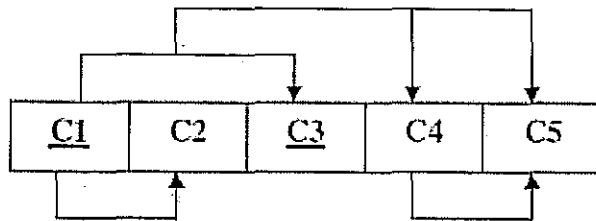
QUESTION 03

a) Define the following dependencies. Give proper example for each.
  i. Full functional dependency.
  ii. Partial functional dependency.
  iii. Transitive dependency.

b) Consider the following relation.

A	B	C
a1	b1	c1
a1	b2	c2
a2	b4	c1
a3	b3	c4
a4	b1	c1
a5	b3	c4

Which of the following dependencies hold in the above relation at this point of time? If the dependency does not hold, explain why, by specifying the tuples that cause the violation.
  i. $A \longrightarrow B$
  ii. $B \longrightarrow C$
  iii. $C \longrightarrow B$
  iv. $B \longrightarrow A$
  v. $C \longrightarrow A$

c) Consider the dependency diagram shown in the following figure. (The primary key attributes are underlined).

| C1 | C2 | C3 | C4 | C5 |

    i.   Identify and discuss each of the indicated dependencies.

    ii.   Based on the above dependency diagram create a database whose tables are in BCNF, showing the dependency diagram for each table.

QUESTION 04

a) Define the following terms. Give proper example for each.

    i.   Super key

    ii.   Candidate key

    iii. Secondary key

b) Give example relations for the following

    i.   A relation which is in second normal form but not in third normal form

    ii.   A relation which is in second and third normal forms but not in Boyce Codd normal form

c) What is the purpose of normalization?

Consider the following relations. Attributes of all relations are atomic.

SupplierPart (<u>sNo, pNo</u>, sName, sPhone, pTitle, pPrice, quantity) with sNo and pNo determine supplier and part information respectively.

Course (<u>code</u>, title, credits) with title is also unique.

Teaching (<u>teacher, course</u>, student, semester) with the additional constraint that students enroll for only one course.

Check whether the relations are in second normal form, third normal form and Boyce Codd normal form (BCNF). If the relation is not in the particular normal form explain why. If any relation is not in particular normal form reduce it into **BCNF**.

QUESTION 05

The following ER diagram describes the student database of the Faculty of Natural Sciences, the Open University of Sri Lanka. Clearly mentioning the rules that you use, transform the ER diagram to normalized relational model.
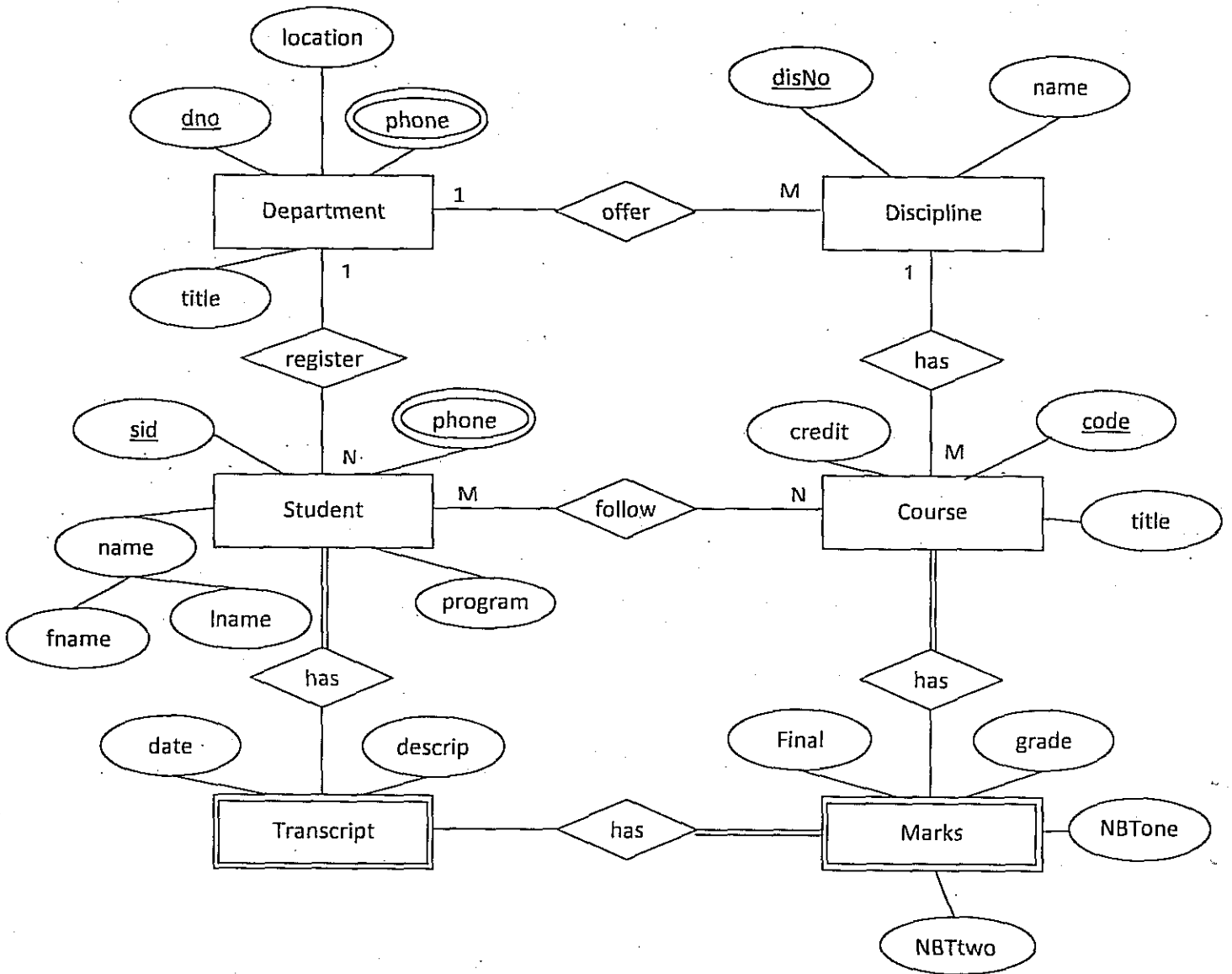
QUESTION 06

The following relational schema illustrates the student database maintained by the Department of Mathematics and Computer Science, The Open University of Sri Lanka.

Student (**stuNumber**, stuName, majorSub, stuLevel, stuAge)

DaySchool (**courseCode, dsDate,** dsTime, dsVenue, coordinatorId)

Enrolled (**stuNumber, courseCode**)

Coordinator (**id**, name, depId)

The meaning of these relations is straightforward; for example, **Enrolled** has one record per **Student-course** pair such that the student is enrolled in the particular course. Write down **SQL** queries to retrieve the following information. No duplicates should be retrieved in any of the answers.

a) Find the **names** of all juniors (stuLevel = level3) who are enrolled in day schools coordinated by **Mr. W.P.C.D. De Silva.**

b) Find the **age** of students who are either a computer major or are enrolled in courses coordinated by **Mr. W.P.C.D. De Silva.**

c) Find the **names** of all students who attend day schools with the student **Suranga.**

d) Find **all students** who are enrolled in day schools which **start at 9.00 am** and coordinated by **Mr. W.P.C.D. De Silva.**

e) Find the **names of coordinators** who coordinate courses taught at the **Auditorium** for students who are **Computer Major.**

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