

THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
B.Sc. DEGREE PROGRAMME: LEVEL 04
FINAL EXAMINATION: 2012/2013
CPU2241: DATABASE MANAGEMENT SYSTEMS



DURATION: THREE HOURS (3 HOURS)

Date: 22nd June 2013

Time: 1.00pm – 4.00pm

Answer FOUR (04) questions ONLY.

QUESTION 01

- a) Explain how you would differentiate *information* from *raw data*.
- b) Describe how you define *good data* in a database.
- c) What are the main steps in database development? Briefly explain.
- d) List the five (5) types of users found in a database system environment and for each one explain the role they play.
- e) Define the *production DBMS*.
- f) Discuss the difference between *DDL* and *DML*.
- g) What is the mathematical representation of a relation?
- h) Write brief notes on the following:
 - i. Relation
 - ii. Attribute
 - iii. Tuple
- i) Explain *Total Participation* in an ER diagram using a proper example.
- j) List four (04) different types of attributes in the relational model. Briefly describe each with a suitable example. (Use the correct symbols to represent the attributes.)
- k) “*Data redundancy must be controlled*”. Explain.
- l) How is the *data dictionary* used in DBMS?

QUESTION 02

Consider the following set of requirements for a garage system that is used to keep track of garage information.

Description

- The system keeps track of details of several garages, which have garage code (code), garage name (name) and the main branch address (mb_address). The code can be used to identify a garage uniquely.
- A garage can have many branches, which have its own branch address (address) and a branch number (branch_no). However, to identify a branch uniquely, branch_no is not sufficient.
- A particular branch provides two types of services namely vehicle repairing and vehicle servicing.
- A branch can provide a variety of repairs. For example engine repair, gearbox repair etc. Each repair is described by the repair id (rep_id), the repair type (rep_type), the repair cost (rep_cost), and the chief technician (chief_tech) of the repair. The rep_id attribute can be used to identify a repair uniquely.
- A branch also provides a variety of services like radiator servicing, air filter servicing etc. Each service is described by the service id (sev_id), the service type (sev_type), and the cost of the service (sev_cost). The sev_id attribute can be used to identify a service uniquely.
- Many branches can provide a particular repair or a particular service. On the other hand a branch can have many repair types and many service types.
- Each vehicle has a registration number (reg_no), a vehicle model (mode), an engine capacity (eng_cap), a year of production (prod_year) and a fuel type (fuel_type). Registration no (reg_no) can be used to identify a vehicle uniquely.
- Customers have customer name (cus_name), customer address (address), phone number (phone) and national identity card number (NIC) which is unique for a customer. A customer can have more than one phone number. Customer name might be accessed by the last name (lname) only.
- A vehicle can be serviced and/or repaired. A vehicle can have many repairs and/or many services. Also many vehicles can be repaired and/or serviced. Once repaired or serviced, the date serviced (sev_date) or the date repaired (rep_date) should be stored.
- A customer can own many vehicles, but each vehicle can have one customer only.

Clearly mentioning the assumptions you make draw a complete ER diagram to satisfy the above requirements.

QUESTION 03

a) Use the following relations to answer the questions.

SALESPERSON

<u>SId</u>	SName	Age	Salary
1	Abe	61	140,000
2	Bob	54	115,000
5	Chris	28	44,000
7	Don	25	40,000
8	Kan	33	38,000

CUSTOMER

<u>CId</u>	CName	City	Industry_Type
004	Samsonic	Pleasant	J
006	Panasung	Oaktown	J
007	Samony	Jackson	B
009	Orange	Jackson	B
005	Samony	Oaktown	Null

ORDER

<u>Number</u>	<u>Order_date</u>	<u>CId</u>	<u>SId</u>	<u>Amount</u>
D001	08-06-2007	004	2	540
D009	30-01-2013	004	8	1800
D010	07-02-2005	009	1	460
D003	29-01-2000	006	2	2400
D005	03-02-2007	007	2	600

Write down SQL queries to retrieve the following information.

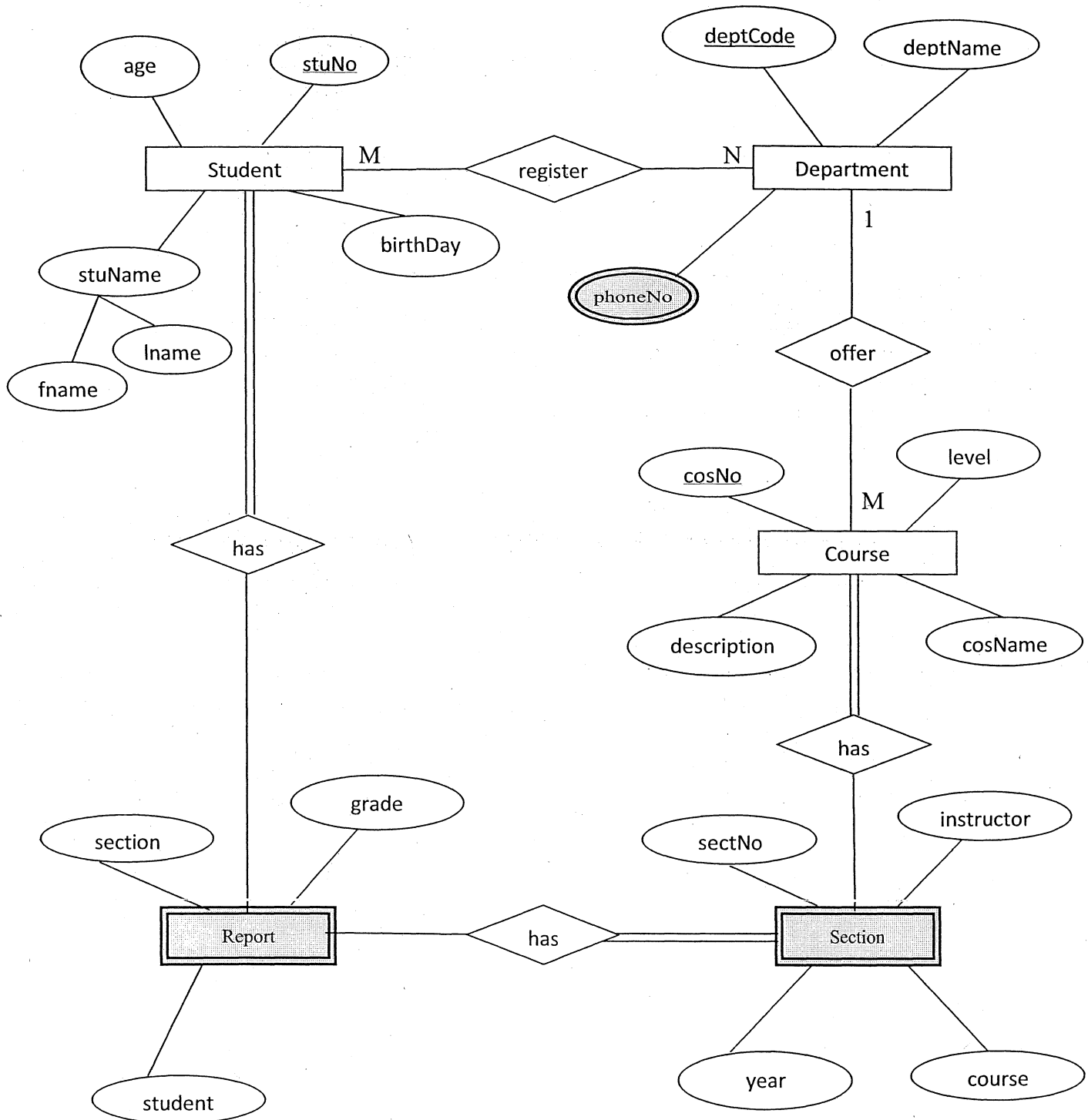
- i. List the *salespeople* with their ids whose *Order_date* is between 2000 and 2007.
- ii. List the *names* of all salespeople that do not have any order with **Samsonic**.
- iii. Find all *salespeople* with their ids that have 02 or more orders.
- iv. Retrieve the highest *Amount* in ORDER.
- v. Using the ORDER table, display the *Number* and *Order_date* of all orders done after 2007 starting with the *latest order*.

b) State **TRUE (T)** or **FALSE (F)** for the following statements. Explain with a proper example.

- i. Sub queries can't contain *group by* clause.
- ii. Multiple columns can be linked by using sub query.
- iii. *Order by* and *having* clauses can't be used within a single query.
- iv. Select SName from SALESPERSON where salary = Null;
This is a correct sql statement.

QUESTION 04

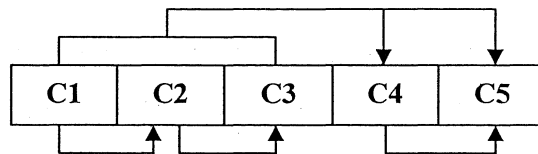
The following ER diagram describes the student database of the Faculty of Natural Sciences, the Open University of Sri Lanka. Clearly mentioning the rules that you use, map the ER diagram to a relational model.



- Student-Report and Course-Section has 1 : M relationships.

QUESTION 05

- a) Define the following dependencies using a proper example for each.
- i. Full functional dependency
 - ii. Partial functional dependency
 - iii. Transitive functional dependency
- b) Use the given dependency diagram below to answer the following questions.
(Primary key attributes are underlined. C1 & C3 together can be considered as unique.)



- i. What do mean by the term *Functional Dependency*?
- ii. Identify all the indicated functional dependencies in the given diagram.
- iii. In what normal form, the database is in? Explain.
- iv. Based on the above dependency diagram, create a database whose tables are in BCNF, showing the dependency diagram for each table.
- v. What will happen to the given database if you add another functional dependency $C1 \longrightarrow C4$? Explain.

QUESTION 06

- a) Define the following terms. Give proper example for each.
- I. Super Key
 - II. Candidate Key
 - III. Foreign Key
- b) Give example relations for the following indicating primary key.
- I. A relation which is in first normal form but not in second normal form.
 - II. A relation which is in second normal form but not in third normal form.
 - III. A relation which is in third normal form but not in Boyce Codd normal form.

c) Normalization is an important process in DBMS.

- I. What is the purpose of normalization?
- II. Consider the following relations. Attributes of all relations are **atomic**.

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

Course (code, title, credits) with title is also unique.

Teaching (teacher, course, 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 or Boyce Codd normal form (BCNF). If the relation is not in the particular normal form (second normal form, third normal form or Boyce Codd normal form), explain why. If any relation is not in particular normal form reduce it into BCNF.

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