Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science and Technology
300 level 1st Semester Examination – Sept. / Oct. 2015
SCT 375-2 Database Management Systems

Instructions to candidates
Duration: 02 hours
Number of questions: 4 Essay Questions
Mark allocation: 100 mark

1.

a. What is a Database Management System (DBMS)? (5 mark)
b. Explain three levels of data abstraction in DBMS? (5 mark)
c. List five (5) advantages of using the DBMS approach. (5 mark)
d. Describe Data Definition Language and Data Manipulation Language. (5 mark)
e. Explain Logical and Physical data independence? (5 mark)

2.

a. Construct an E-R diagram for a car insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents. Each insurance policy covers one or more cars, and has one or more premium payments associated with it. Each payment is for a particular period of time, and has an associated due date, and the date when the payment was received. (10 mark)

b. A weak entity set can always be made into a strong entity set by adding to its attributes the primary-key attributes of its identifying entity set. Outline what sort of redundancy will result if we do so. (2 mark)

c. Answer to the following questions using a Figure 1, E-R diagram developed for a university.
   i. Write schema representations for all strong entity sets with simple attributes. (3 mark)
   ii. Derived all schema representations from relationship sets. (10 mark)

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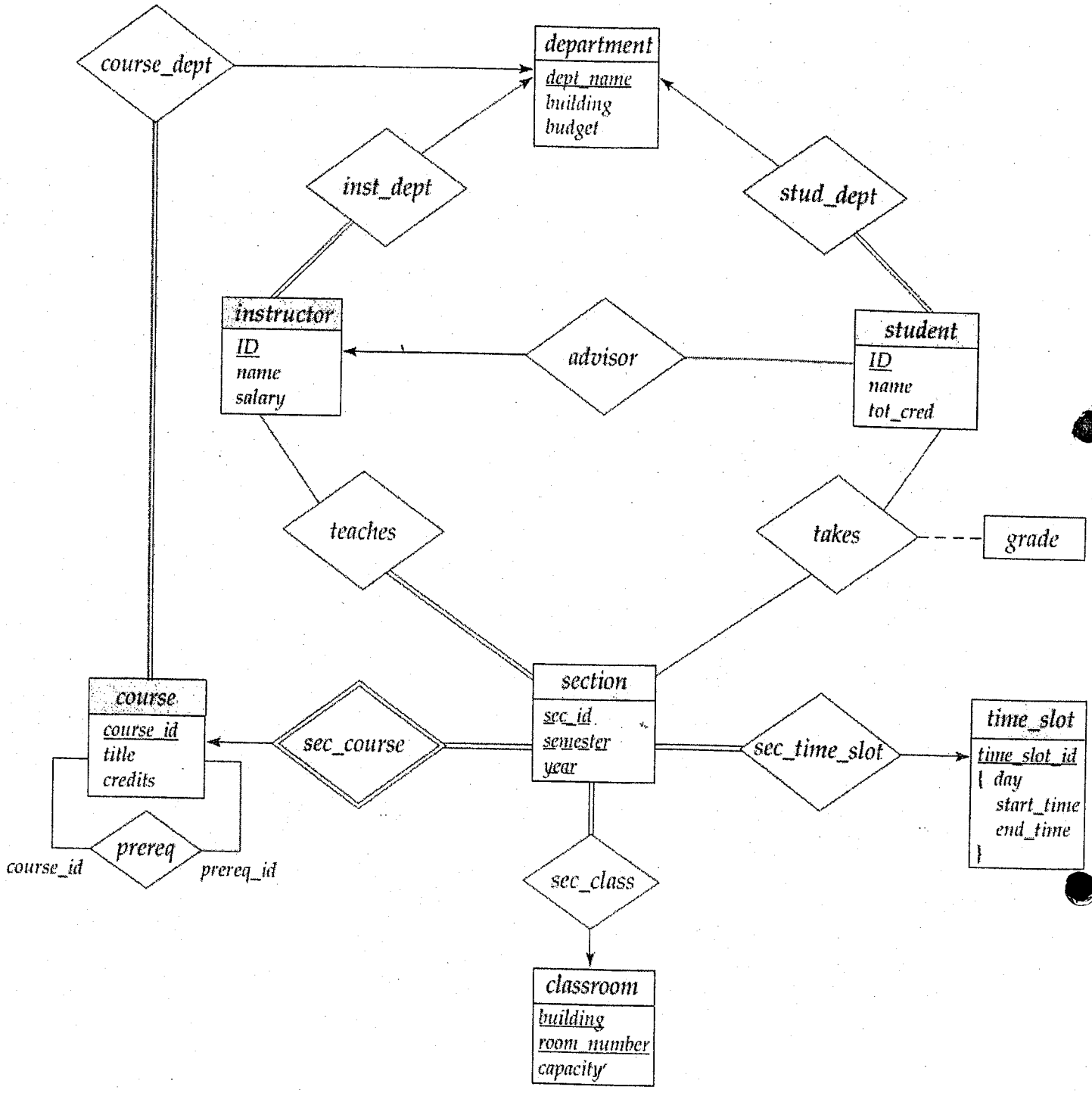

Figure 1: E-R diagram for a university

3.

a. Explain Specialization and Generalization of DBMS. (8 mark)
b. List all steps of normalization process. (5 mark)
c. Explain the requirements for following Normal Forms (NF). (12 mark)
   i. 1NF
   ii. 2NF
   iii. 3NF
   iv. BCNF

4. Use the following Figure 2: Company Database for answering following questions.

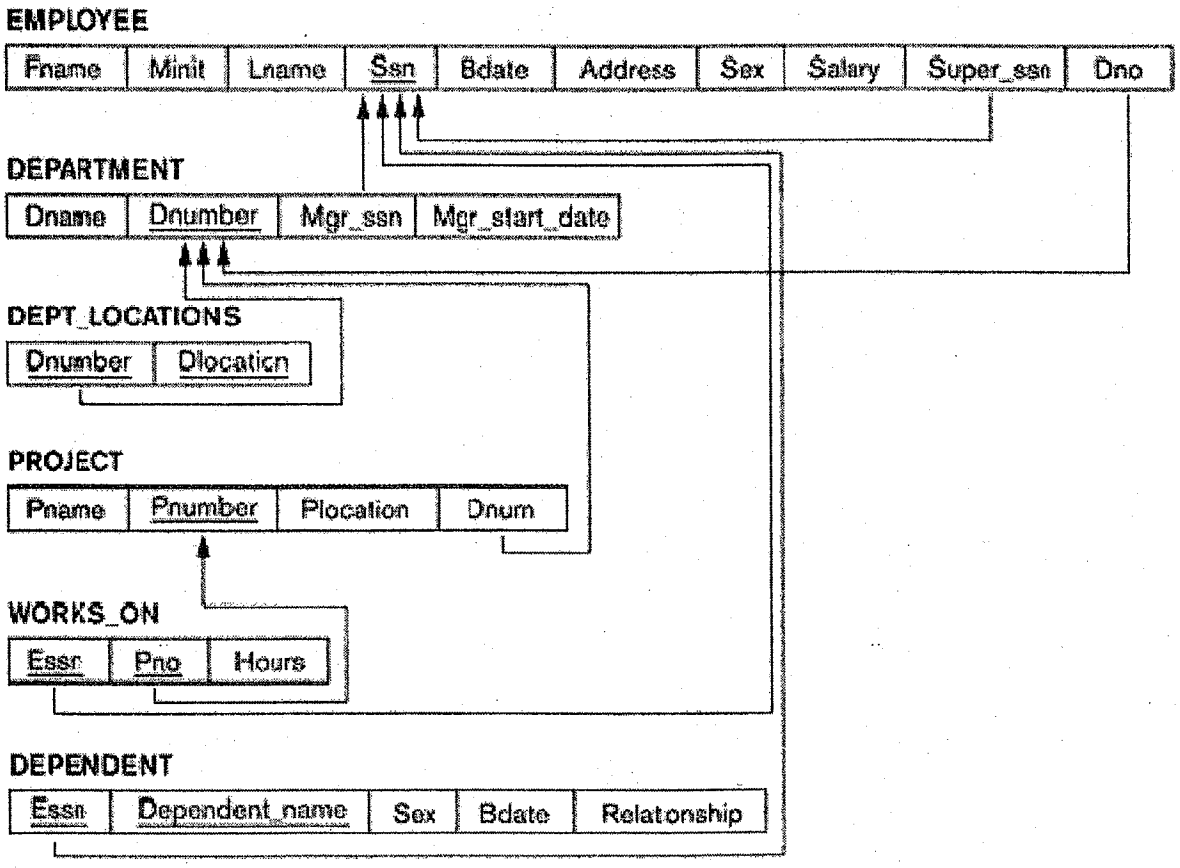

Figure 2: Company Database

a. Write the SQL queries for the following tasks.

i. For each department, retrieve the department name (Dname), and the average salary of employees working in that department. (2 mark)

ii. Retrieve the average salary of all female employees. (2 mark)

iii. Find the names and addresses of employees who work on at least one project located in Colombo but whose department has no location in Colombo. (3 mark)

iv. List the last names of department managers who have no dependents. (3 mark)

v. For each department whose average employee salary is more than Rs.30000, retrieve the department name and the number of employees working for that department. (3 mark)

b. Write relational algebra expressions for the following tasks.

i. Retrieve the first name (Fname), last name (Lname), and salary of all employees who work in department number 5. (3 mark)

ii. Retrieve the Social Security numbers (Ssn) of all employees who either work in department 5 or directly supervise an employee who works in department 5. (3 mark)

iii. Retrieve the name of the manager of each department. (3 mark)

c. Explain the main difference between CARTESIAN PRODUCT and JOIN. (3 mark)