UNIVERSITY OF GHANA

BACHELOR OF SCIENCE IN ENGINEERING

SECOND SEMESTER EXAMINATION 2014/2015

CPEN 102: INTRODUCTION TO DATABASE SYSTEMS (3 Credits)

TIME ALLOWED: ***THREE (3) HOURS***

INSTRUCTION: Answer ALL questions.

Question 1

(a) Explain five functionality of a DBMS

[5 marks]

(b) Differentiate between the following with an example if possible ;

(i) Database state and database schema.
(ii) Entity type and entity set.
(iii) Foreign key and surrogate key.
(iv) M:N relationship type and 1:N relationship type.
(v) DML and DDL

[10 marks]

(c) Draw UML class diagram for a company scenario described below.

The company is organized into DEPARTMENTs. Each department has a name, number and an employee who *manages* the department. We keep track of the start date of the department manager. A department may have several locations. Each department controls a number of PROJECTs. Each project has a unique name, unique number and is located at a single location. We store each EMPLOYEE's social security number, address, salary, sex, and birthdate. Each employee *works for* one department but may *work on* several projects. We keep track of the number of hours per week that an employee currently works on each project. We also keep track of the *direct supervisor* of each employee. Each employee may *have* a number of DEPENDENTs. For each dependent, we keep track of their name, sex, birthdate, and relationship to the employee.

[10 marks]

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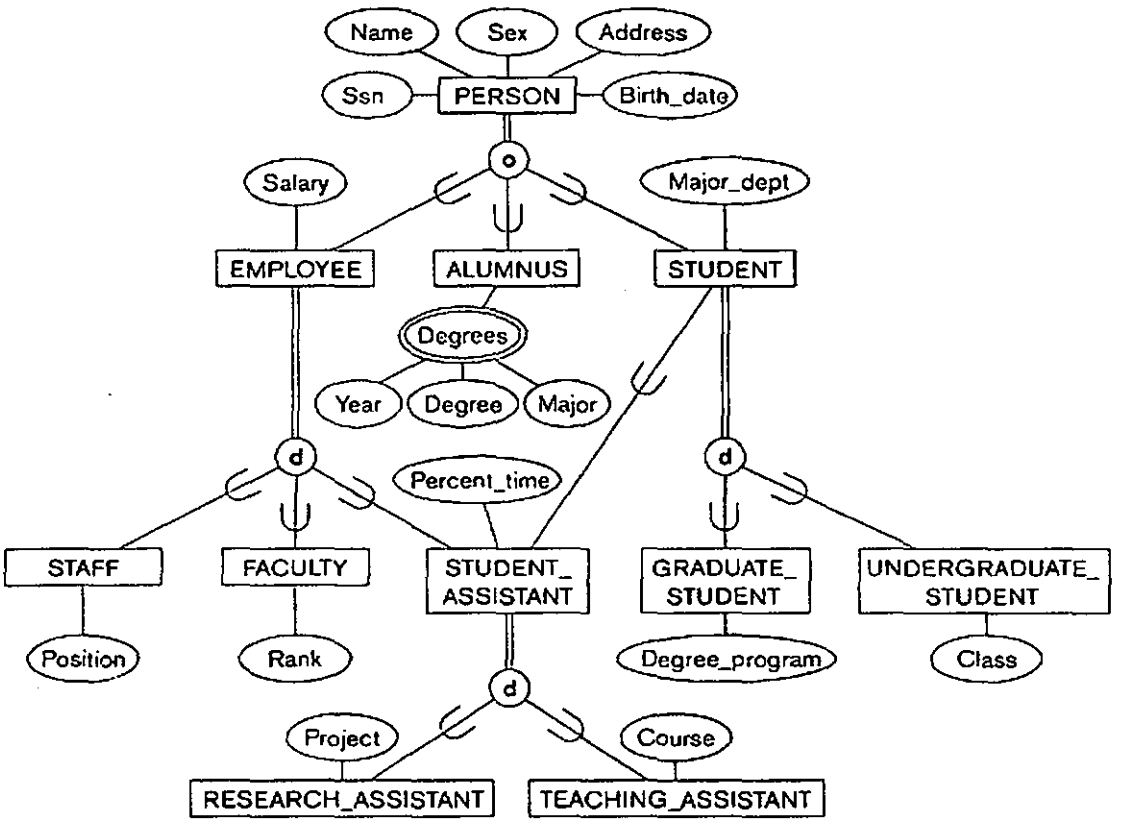
Question 2

(a) Consider the Enhanced Entity Relationship (EER) diagram for a university database below. Translate this diagram to its corresponding relational schema.



[20 marks]

(b) Using SQL statement, create a table for the PERSON entity. Specifying referential integrity constraint.

[5 marks]

Question 3 **Use the exhibit below to write SQL queries for the following questions.**

(a) Retrieve the name and address of all employees who work for the 'Research' department.

[3 marks]

(b) For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.

[3 marks]

(c) Retrieve a list of employees and the projects each works in, ordered by the employee's department, and within each department ordered alphabetically by employee last name.

[3 marks]

(d) Create a view that records, department name, number of employees in the department total salary for each department from department and employee's tables.

[3 marks]

(e) Retrieve the names of employees who have their first name the same as the first name of their dependents.

[3 marks]

(f) For each project on which more than two employees work, retrieve the project number, project name, and the number of employees who work on that project.

[3 marks]

(g) Change the location and controlling department number of project number 10 to 'Bellaire' and 5, respectively.

[3 marks]

(h) Retrieve all information on employees who are managers

[4 marks]

Question 4

(a) At a car garage, a customer can place an order for a car in three modes, via telephone, web page or in person. Before an order can be accepted and processed, sales staff must verify all information to be accurate. Based on the scenario, the necessary data requirement has been organized below.

Select a primary key and translate the data below to the third normal form explaining each form.

Order (orderNumber, orderDate, customerName, orderCreationMethodName, verifyingEmployeeName, totalSalesAmount, carSerialNumber, carColourNames, carMakeModelYearNote)

[10 marks]

(b) Explain briefly, the following security measures that can be used to protect the data stored in a database.

(i) Access controls

(ii) Views
(iii) Integrity
(iv) Encryption
(v) RAID technology

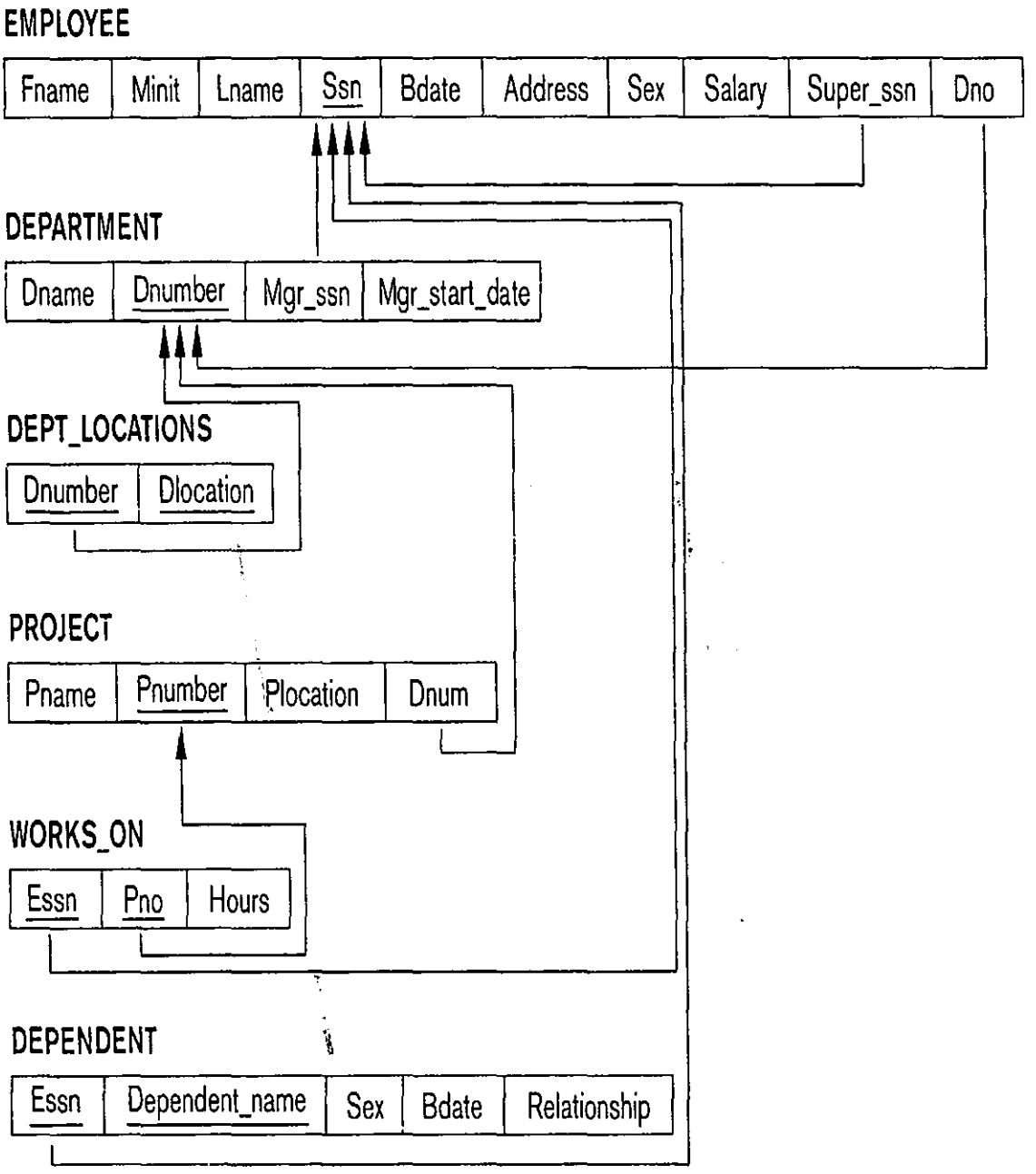
[5 marks]

(c) Create a trigger for the employee table. Store in a separate table the name of the user, the time, date that user performs any update (insert or delete) on the table.

[10 marks]

EXHIBIT

Referential integrity constraints displayed on the COMPANY relational database schema.



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