UNIVERSITY OF GHANA

BACHELOR OF SCIENCE IN ENGINEERING

SECOND SEMESTER EXAMINATIONS, 2014

LEVEL 100: CPEN 102 INTRODUCTION TO DATABASE SYSTEMS (3 Credits)

TIME ALLOWED: *THREE (3) HOURS*

INSTRUCTION: Answer ALL questions.

Question 1

(a) Give five (5) advantages of using database systems to store data. **[5 marks]**

(b) Differentiate between the following as used in database systems;

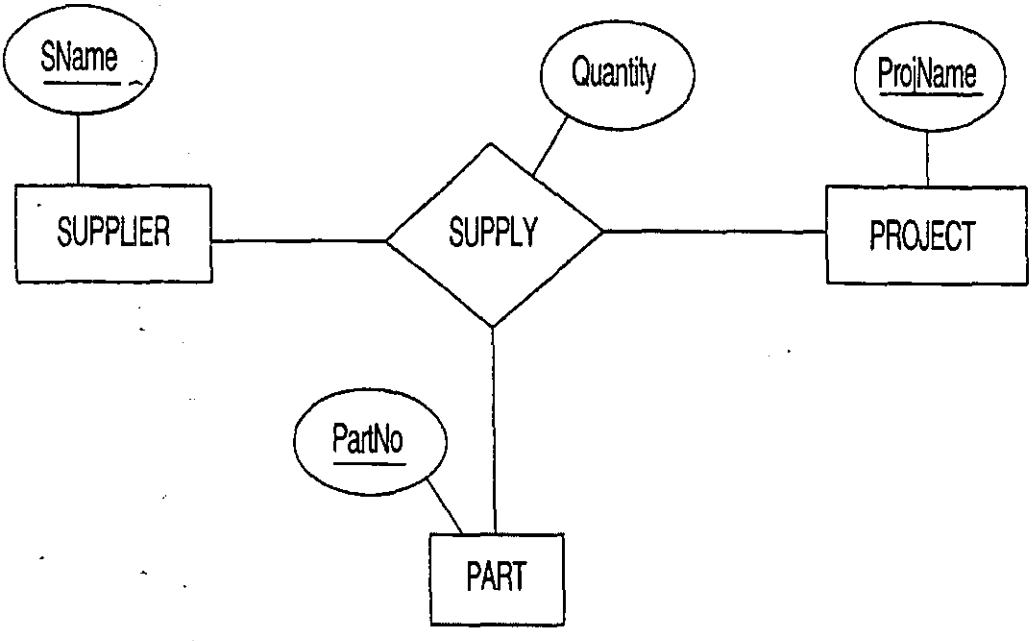
i. "actors on the scene" and "workers behind the scene".
ii. Logical data independence and physical data independence.
iii. Recursive relationship type and regular relationship type.
iv. Specialization and generalization.
v. Key and a super key of a relation.

[10 marks]

(c) Translate the following Entity/Entity Relationship (E/ER) diagram to its corresponding relational schema.

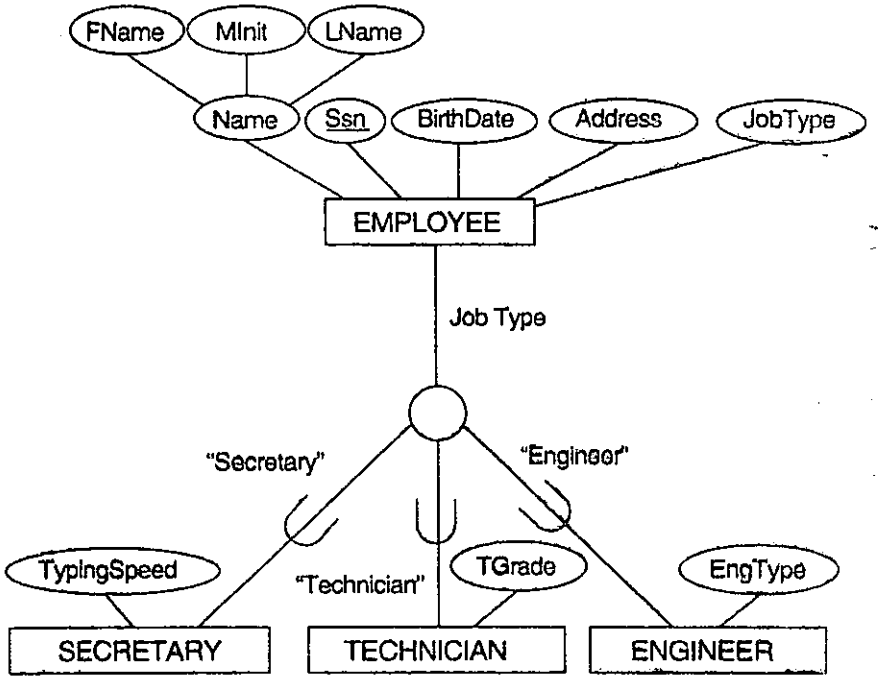
(i)

(a)



EXAMINER: GEORGE KODJO ANNI

(ii)



[10 marks]

EMPLOYEE

FNAME	MINIT	LNAME	SSN	BDATE	ADDRESS	SEX	SALARY	SUPERSSN	DNO

(d) Using SQL statement, create the table above with the following information;
   i. FNAME, BDATE and LNAME must always have a value.
   ii. SUPERSSN and DNO are foreign keys in the table.
   iii. Whenever a primary key is updated or deleted, its corresponding foreign key should also be updated or set null respectively.

[10 marks]

(e) There are three (3) *main types* of constraints in the relational model. With the aid of an example, explain these constraints.

[5 marks]

Question 2

(a) Consider the following set of requirements for a university database that is used to track students' transcripts.

(i) The university keeps track of each student's name, student number, and social security number, current address and phone, permanent address and phone, birthdate, sex, class (freshman, sophomore, ..., graduate), major department, minor department (if any), and degree program (B.A., B.S., ..., Ph.D.). Some user

applications need to refer to the city, state, and zip of the student's permanent address, and to the student's last name. Both social security number and student number have unique values for each student.

(ii) Each department is described by a name, department code, office number, office phone, and college. Both name and code have unique values for each department.

(iii) Each course has a course name, description, course number, number of semester hours, level, and offering department. The value of course number is unique for each course.

(iv) Each section has an instructor, semester, year, course, and section number. The section number distinguishes different sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, ...; up to the number of sections taught during each semester.

(v) A grade report has a student, section, letter grade, and numeric grade (0, 1, 2, 3, 4 for F, D, C, B, A, respectively).

Draw an ER diagram for the scenario above. Specify key attributes of each entity type and structural constraints on each relationship type. Note any unspecified requirements, and make appropriate assumptions to make the specification complete.

[20 marks]

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

(a) For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birthdate.

[3 marks]

(b) Retrieve the name of each employee who has a dependent with the same first name as the employee.

[3 marks]

(c) Find the average salary, among employees who work for the 'Administration' department.

[3 marks]

(d) Retrieve the names of employees who have no dependents.

[3 marks]

(e) 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]

(f) Insert a tuple for a new EMPLOYEE for whom we only know the FNAME as Richard, LNAME as Marini, and SSN as 653298653 attributes.

[3 marks]

(g) Give all employees in the 'Accounting' department a 10% raise in salary.

[2 marks]

Question 4 Use the exhibit to write SQL queries for the following questions.

(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) Create a trigger for the employee salary. Store in a separate table the name of the user, the time, date and the old values (if any change has occurred in the salary).

[10 marks]

EXHIBIT

Referential integrity constraints displayed on the COMPANY relational database schema.