FACULTY OF MANAGEMENT AND ADMINISTRATION

COURSE TITLE: CIS301: DATABASE CONCEPTS

SEMESTER 2: MAIN EXAMINATION NOV-DEC 2014

LECTURER: Agrippah Kandiero

TIME: 3 HOURS

Answer questions as specified in each section.
Total possible mark is **100.**

Start **each Section B** question on a new page in your answer booklet.

The marks allocated to **each** question are shown at the end of the section.

Avoid zero-intelligible content and answer in expanded bullet point form.

Credit will be awarded for logical, systematic and neat presentations.

1. Define and illustrate the following database concepts using practical examples. **[10]**
    a. Data redundancy
    b. Data inconsistency
    c. Data anomaly
    d. Update anomaly
    e. Deletion anomaly
    f. Insertion anomaly
2. Using specific examples define and illustrate the following database concepts
    a. Multiplicity **[5]**
    b. Weak (non-identifying) relationship **[5]**
    c. Strong (identifying) relationship **[5]**
3. Define and illustrate the following database concepts
    a. Specialization hierarchy **[5]**
    b. Aggregation **[5]**
    c. Composition **[5]**

SECTION B - ANSWER ANY **ALL** QUESTIONS **[60 MARKS]**

1. **Normalization [20 Marks]**
    a) Using the INVOICE table structure shown in Table P7.1, write the relational schema, draw its dependency diagram and identify all dependencies (including all partial and transitive dependencies). You can assume that the table does not contain repeating groups and that any invoice number may reference more than one product. (*Hint*: This table uses a composite primary key.) **[10]**

Table P7.1 Sample INVOICE Records

Attribute Name	Sample Value	Sample Value	Sample Value	Sample Value	Sample Value
INV_NUM	211347	211347	211347	211348	211349
PROD_NUM	AA-E3422QW	QD-300932X	RU-995748G	AA-E3422QW	GH-778345P
SALE_DATE	15-Jan-2006	15-Jan-2006	15-Jan-2006	15-Jan-2006	16-Jan-2006
PROD_LABEL	Rotary sander	0.25-cm. drill bit	Band saw	Rotary sander	Power drill
VEND_CODE	211	211	309	211	157
VEND_NAME	NeverFail, Inc.	NeverFail, Inc.	BeGood, Inc.	NeverFail, Inc.	ToughGo, Inc.
QUANT_SOLD	1	8	1	2	1
PROD_PRICE	€34.46	€2.73	€31.59	€34.46	€69.32

    b) Using the initial dependency diagram drawn in Problem 1, remove all partial dependencies, draw the new dependency diagrams, and identify the normal forms for each table structure you created. **[10]**
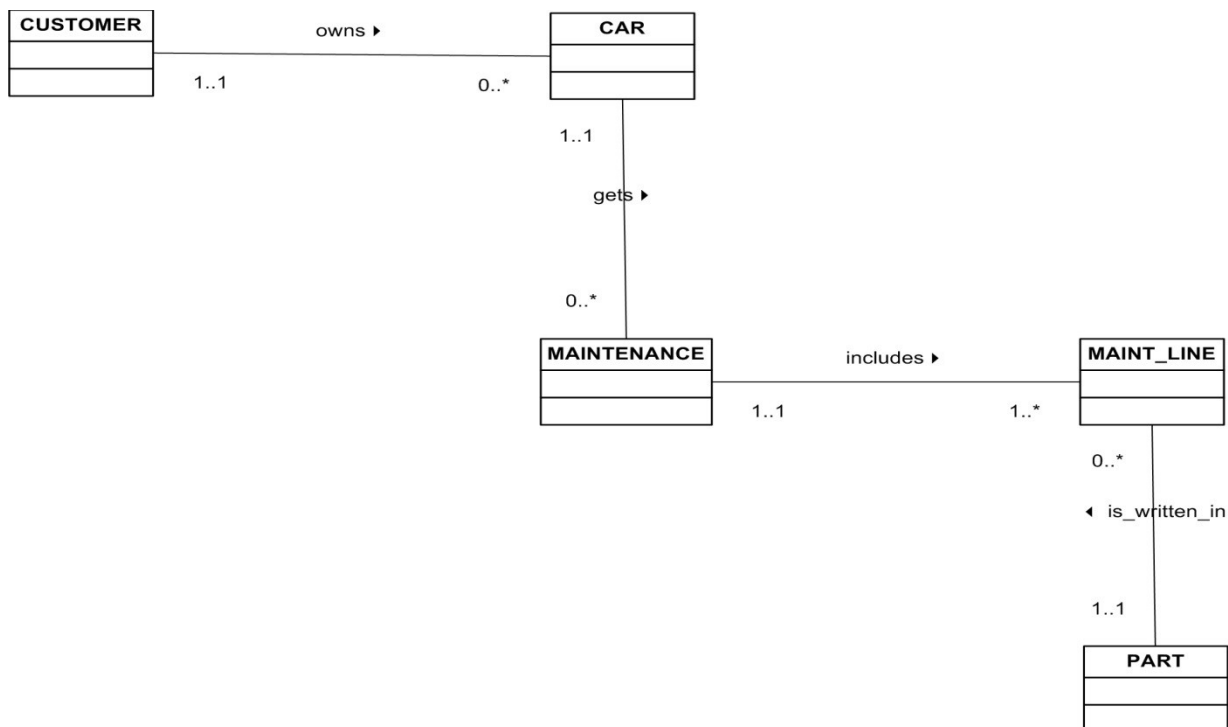
2. **Advanced Data Modelling [20 Marks]**

a. AVANTIVE Corporation is a company specializing in the commercialization of automotive parts. AVANTIVE has two types of customers: retail and wholesale. All customers have a customer ID, a name, an address, a phone number, a default shipping address, a date of last purchase, and a date of last payment. Retail customers have the credit card type, credit card number, expiration date, and e-mail address. Wholesale customers have a contact name, contact phone number, contact e-mail address, purchase order number and date, discount percentage, billing address, tax status (if exempt), and tax identification number. A retail customer cannot be a wholesale customer and vice versa. Given that information, create the ERD containing all primary keys, foreign keys, and main attributes. [10]

b. AVANTIVE Corporation has five departments: administration, marketing, sales, shipping, and purchasing. Each department employs many employees. Each employee has an ID, a name, a home address, a home phone number, and a salary and tax ID (Social Security number). Some employees are classified as sales representatives, some as technical support, and some as administrators. Sales representatives receive a commission based on sales. Technical support employees are required to be certified in their areas of expertise. For example, some are certified as drivetrain specialists; others, as electrical systems specialists. All administrators have a title and a bonus. Given that information, create the ERD containing all primary keys, foreign keys, and main attributes. [10]

3. **Relational Data Modelling [20 Marks]**

a) Given the business rule "an employee may have many degrees," discuss its effect on attributes, entities, and relationships. (*Hint*: Remember what a multivalued attribute is and how it might be implemented.) **[10]**

b) Suppose you are working within the framework of the conceptual model in Figure Q5.5, write the business rules that are reflected in it. **[10]**

Figure Q5.5 The Conceptual Model for Question 5

THE END