

Faculty: ST

Department of Computer Science

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L2 : Information Systems

Final Exam

Course questions (6 pts)

- 1- Can an object exist **without attributes other than its identifier**? Explain.
- 2- Why are CDM and CPM considered **independent of implementation and technology**?
 - Describe the **Conceptual Processing Model (CPM)** in the MERISE methodology.
Your explanation should include: Its purpose and the concepts of event and process

Exercise 1 (7 pts) : Analysis of Information Flows

A commercial enterprise manages customer orders for products.

The company interacts with customers and suppliers and includes several internal departments.

Management Rules

- A **customer** sends an **order request** to the company.
- The **Sales Department** checks product availability.
- If the product is available, the **Sales Department** sends an **order confirmation** to the customer.
- The **Accounting Department** issues an **invoice** and sends it to the customer.
- The customer sends a **payment notice** to the Accounting Department.
- If the product is not available, the **Purchasing Department** sends a **purchase order** to the supplier.
- The **supplier** sends a **delivery note** to the company.
- Once the product is received, the **Warehouse** informs the Sales Department.
- The **Warehouse** distributes the product and sends a **delivery confirmation** to the customer.

1. Identify the **external actors** and **internal actors**.
2. Identify the **information flows** exchanged between actors.
3. Construct the **flow matrix**.

Exercise 2 (7 pts) : Functional Dependencies and Conceptual Data Model

A coffee shop wants to model the data needed to manage customers, drinks, orders, and servers.

Given Functional Dependencies:

1. CustomerID → CustomerName, CustomerEmail
2. DrinkID → DrinkName, Price
3. ServerID → ServerName
4. OrderID → OrderDate, CustomerID
5. OrderID → ServerID
6. (OrderID, DrinkID) → Quantity

Questions:

- 1- Into which normal form is the following set of functional dependencies? Explain..
- 2- Identify the identifiers and attributes associated with each object.
- 3- Construct the functional dependencies graph.
- 4- Based on the obtained graph, deduce the Conceptual Data Model (CDM)

أسئلة الدرس (6 نقاط)

- 1- هل يمكن لكائن (Object) أن يوجد بتعيين Identifier فقط ؟ فسّر ذلك.
- 2- لماذا يُعتبر كلٌّ من CDM (النموذج المفاهيمي للبيانات) و CPM (النموذج المفاهيمي للمعالجة) مستقلّين عن التنفيذ والتكنولوجيا؟
- 3- صف النموذج المفاهيمي للمعالجة (CPM) في منهجية MERISE. يجب أن يتضمن شرحك:

- هدفه
- مفهومي الحدث (Event) و المعالجة (Process)

التمرين 1 (7 نقاط): تحليل تدفّقات المعلومات

تدير مؤسسة تجارية طلبات الزبائن الخاصة بالمنتجات. تتعامل الشركة مع الزبائن والموردين وتضمّ عدة أقسام داخلية.

قواعد التسيير

- يرسل الزبون طلب شراء إلى الشركة.
- يتحقق قسم المبيعات من توفر المنتج.
- إذا كان المنتج متوفراً، يرسل قسم المبيعات تأكيد الطلب إلى الزبون.
- يصدر قسم المحاسبة فاتورة ويرسلها إلى الزبون.
- يرسل الزبون إشعار الدفع إلى قسم المحاسبة.
- إذا لم يكن المنتج متوفراً، يرسل قسم المشتريات طلب شراء إلى المورد.
- يرسل المورد إشعار تسليم إلى الشركة.
- عند استلام المنتج، يُعلم المستودع قسم المبيعات.
- يورّع المستودع المنتج ويرسل تأكيد التسليم إلى الزبون.

1. حدّد الأطراف الخارجية والأطراف الداخلية.
2. حدّد تدفّقات المعلومات المتبادلة بين الأطراف.
3. أنشئ مصفوفة التدفّقات.

التمرين 2 (7 نقاط): التبعيات الوظيفية والنموذج المفاهيمي للبيانات

يرغب مقهى في نمذجة البيانات اللازمة لإدارة الزبائن، المشروبات، الطلبات، والنوادل.

التبعيات الوظيفية المعطاة:

1. CustomerID → CustomerName, CustomerEmail
2. DrinkID → DrinkName, Price
3. ServerID → ServerName
4. OrderID → OrderDate, CustomerID
5. OrderID → ServerID
6. (OrderID, DrinkID) → Quantity

- 1- في أي صيغة معيارية (Normal Form) تقع مجموعة التبعيات الوظيفية ؟ فسّر ذلك.
- 2 - حدّد المعرّفات (Identifiers) والخصائص المرتبطة بكل كائن.
- 3 - انشئ مخطط التبعيات الوظيفية.
- 4- اعتماداً على المخطط المتحصّل عليه، استنتج النموذج المفاهيمي للبيانات (CDM) كاملاً.

Solutions

Course questions

- 1- Yes. An object may contain only its identifier if no additional information is required at the conceptual level.
- 2- Because they are defined at the conceptual level and do not depend on software, hardware, or organizational choices
- 3- The **Conceptual Processing Model (CPM)** describes the **dynamic behavior** of an information system. Its purpose is to model **what the system does**, independently of how, where, or by whom it is done.

The CPM is based on two fundamental concepts:

- **Events**, which are pieces of information entering or leaving the system (e.g., order received, invoice sent).
- **Processes (treatments)**, which are sets of operations executed by the system in response to events.

An event triggers one or more processes, and each process produces results that may generate new events.

Exercise 1

1. Identification of Actors

External Actors

- Customer (0.25 pts)
- Supplier (0.25)

Internal Actors

- Sales Department (0.25)
- Accounting Department (0.25)
- Purchasing Department (0.25)
- Warehouse (0.25)

2. Identification of Information Flows

No.	Sender	Receiver	Information Flow
1	Customer	Sales Dept.	Order request (0.25)
2	Sales Dept.	Customer	Order confirmation (0.25)
3	Sales Dept.	Accounting Dept.	Order details (0.25)
4	Accounting Dept.	Customer	Invoice (0.25)

No.	Sender	Receiver	Information Flow
5	Customer	Accounting Dept.	Payment notice (0.25)
6	Sales Dept.	Purchasing Dept.	Replenishment request (0.25)
7	Purchasing Dept.	Supplier	Purchase order (0.25)
8	Supplier	Warehouse	Delivery note (0.25)
9	Warehouse	Sales Dept.	Product availability notice (0.25)
10	Warehouse	Customer	Delivery confirmation (0.25)

3. Flow Matrix

Sender \ Receiver	Customer	Sales Dept.	Accounting Dept.	Purchasing Dept.	Warehouse	Supplier	
Customer	—	Order request	Payment notice	—	—	—	0.5
Sales Dept.	Order confirmation	—	Order details	Replenishment request	—	—	0.5
Accounting Dept.	Invoice	—	—	—	—	—	0.5
Purchasing Dept.	—	—	—	—	—	Purchase order	0.5
Warehouse	Delivery confirmation	Availability notice	—	—	—	—	0.5
Supplier	—	—	—	—	Delivery note	—	0.5

Exercise 2

1- The set of functional dependencies satisfies the three constraints of the Third Normal Form (3NF) because:

- all identified objects have identifiers, and their attributes are atomic;
- there is no attribute that depends on only part of an identifier in any of the objects;
- there is no transitive dependency.

2- Identification of Objects

From the simple and composite left attributes in FDs, we identify the following objects:

Left Attribute	Derived Object
CustomerID	CUSTOMER
DrinkID	DRINK
OrderID	ORDER (0.5)
ServerD	SERVER. (0.5)

- Identification of objects , identifiers and Attributes

CUSTOMER (0.5 pts)

Identifier: CustomerID

Attributes: CustomerName, CustomerEmail

DRINK (0.5 pts)

Identifier: DrinkID

Attributes: DrinkName, Price

ORDER (0.5 pts)

Identifier: OrderID

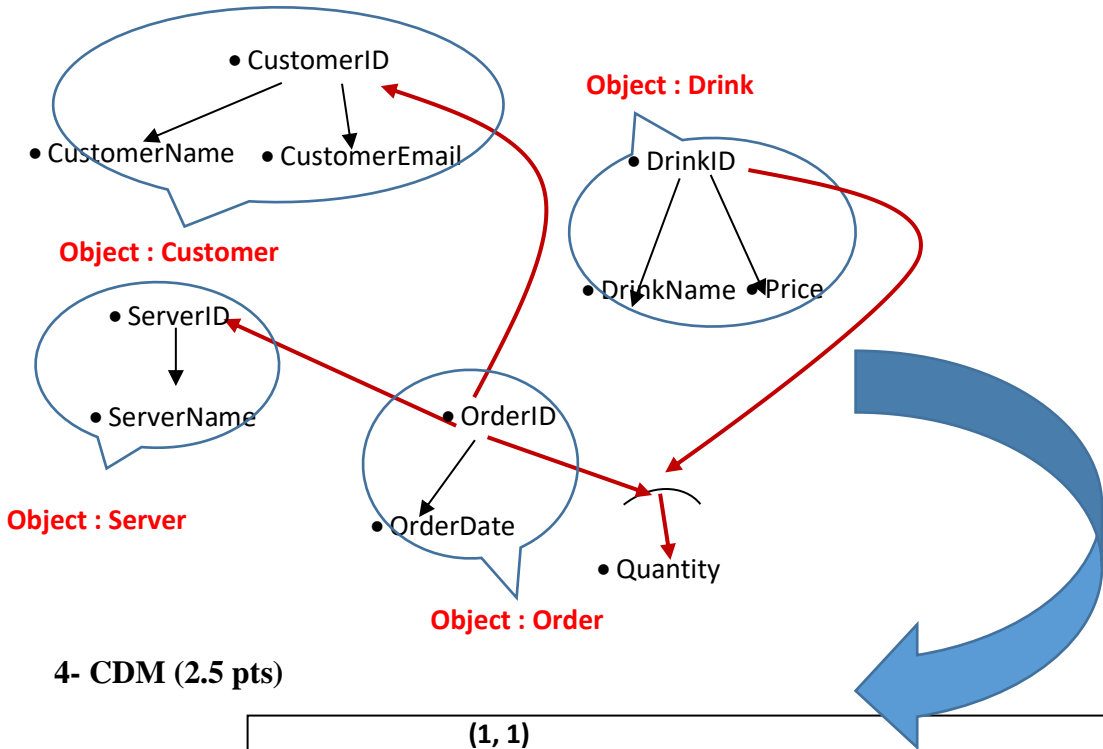
Attributes: OrderDate

SERVER (0.5 pts)

Identifier: ServerID

Attributes: ServerName

3- Graph of Fds (2.5 pts)



4- CDM (2.5 pts)

