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| ID Number: u3216405   |  |  | | --- | --- | | 2013_CMYK Faculty of Science and TechnologySemester 1, 2021 |  |  Unit Name: DATABASE DESIGN **Unit Number: 5915**  **Time Allowed:** 48 hours. Start from 10 May 2021 at 13:00 End 12 May 2021 at 13:00.  **Permitted Materials:** Open book  **Marks on this paper:** 100 Marks  **Marks for assessment:** 55%  **Instructions for Students**   1. This take-home assessment is worth 100 Marks and 55% of the total marks of this unit. 2. Attempt to answer ALL THE QUESTIONS. 3. Write your answers **to this word document** and provide an image for ERD and uploaded this to Canvas in **MS Word or pdf format**. Please ensure that you upload the correct file format to canvas and it’s readable to the assessors. 4. This is an open book assessment which means you are permitted to use any materials handed out in class, your notes from the course, the textbook, and the internet. The materials from any other sources should be properly quoted and referenced. 5. Use in-text reference where appropriate and follow Harvard style. Include the bibliography at the end. 6. This is an individual assignment. The assessment must be taken completely alone. Showing it or discussing it with anyone is forbidden. 7. You must achieve at least 50% of the available marks in the Take Home Assessment to pass this unit. |  |

**Extensions**

Students can apply for an extension to the submission due date for an assessment item due to extenuating, evidenced circumstances (specific details are found in the [*Assessment Procedures*](https://www.canberra.edu.au/Policies/PolicyProcedure/Index/261)). Please see the [unit outlines](https://www.canberra.edu.au/coursesandunits/unit-outline-staff/_nocache?proposal_id=83663) for full details.

An Assignment Extension form is available from the [Student Forms](https://www.canberra.edu.au/content/myuc/utility/forms.html) page.

# Part 1. General questions. [20 marks]

1. **Describe the 3-layer ANSI-SPARC architecture. Describe two advantages of this architecture. How does this architecture address the issue of data independence for a database system? (8 marks)**

The **3-layer ANSI-SPARC architecture** is to allow multiple users to access the same data inside a database simultaneously. The structure also allows users to change the conceptual aspect of the database. Users are not required to know information prior to using the database, but can query for information from the database.

ANSI-SPARC architecture involves the following levels ***[1]:***

1. External level = the users view of database
2. Conceptual level = the community view of the database. It shows what data is stored in database and its relationships
3. Internal level = the physical representation of the database on the computer. It is how the data is stored in the database

**Two advantages:**

ANSI-SPARC allows multiple users to simultaneously view the database. Each user does not affect each other’s ability to view the database.

Database Admins will not need to rewrite the program to manipulate data as the data is independent.

ANSI-SPARC architecture enables **data independence** for a database system through logical and physical data independence, where changes in the conceptual schema do not affect the external schema, as well as changes in the internal schema do not affect the conceptual schema.

1. **Why do we use normalization? How does normalization assist in reducing redundancies on a designed database? (6 marks)**

Normalization is used to reduce repeating data in a database which ultimately reduces anomalies and redundancies, as well as allowing easy access and manipulation of the database data. This means, if a cell data is changed in the database, it will not affect the other data, and the admin will not have to change multiple cells in order to alter one cell.

Because normalization reduces repeating data, it also minimizes the storage space that a database consumes on a computer.

1. **How does a data dictionary can assist you in implementing your database? Describe two benefits of a data dictionary when implementing a database? Describe one problem that you may encounter if you do not have a data dictionary for a database when implementing that database? (6 marks)**

Data dictionaries provide data about data, where an authorized database user can check and clarify that database information that it has integrity, data consistency, and minimizes redundancies for all users. They can assist with developing user interfaces and menus when implementing a database.

Data Dictionaries provide detailed information about attributes (e.g. written descriptions, names, etc.). Data dictionaries can also be used to make derived attributes as information is easily accessible.

As a Data Dictionary allows Database Designers to look for meanings of attributes/elements in the database, if there is no data dictionary available ***[3]***, designers may find it problematic to develop the database efficiently, as they will have to manually find out how to create attributes/elements relationships. Employees who need to use the database may also find it difficult to understand the databases’ data, and will not have the data dictionary as a resource to understand the information.

Additionally, without a data dictionary - developing the database will be slow, as designers will need to do their own research to find out the meaning of some attributes/elements.

**Part 2. Normalization [20 marks total]**

**The following below displays the details of driving class, client, and vehicle.**

Class (ClassID, DateAndTime, ClientFirstName, CientLastName, Sex, DOB, TelPhone, Email)

Vehicle (RegistrationNo, colour, model, make, DealerName, DealerTel, Dealerfax, DealerAddress, ServiceDate, ServiceDescription)

1. **Provide two examples to show the insertion, deletion and update anomalies of the entities shown above. (5 marks)**

**Insertion anomaly**

1. if an admin wants to add middle names, they will have to add a middle name attribute twice (in the Class and Client relations).

**Deletion anomaly**

1. if an admin wants to delete a name, they will have to delete it from two relations (class and vehicle)

**Update anomaly**

1. if an admin wants to change a clients’ first name and last name, they will need to change a Client’s first name, they will need to update 8 attributes instead of 1.
2. **Explain why the entities above are not in 3NF? (5 marks)**

The entities above are not in 3NF as there are no primary keys, no foreign keys, no relationships, there are excessive attributes (e.g. DealerName, ClientFirstName) that could just be one attribute for both dealers and clients (e.g. just Fname and Lname. Additionally, Client information is in the Class relation, and should be separated into a new relation/entity. Additionally, there are no client number, meaning there would be no way to relate a client to any other entity (need ClientNo).

Address should also be a separate entity as it has its attributes of its own (StreetNo, etc.).

Transitive dependency is existent in the above entities – Which is the opposite purpose of 3NF ***[2].***

1. **Convert the entities above into Third Normal Form (3NF). Create a data dictionary for your design. (10 marks)**

**Client**(ClientNo, FName, LName, Sex, DOB, TelPhone, Email, ClassID(FK), RegistrationNo(FK), AddressNo(FK))

**Class**(ClassID, DateAndTime)

**Vehicle**(RegistrationNo, colour, model, make, ServiceDate, ServiceDescription, ClientNo(FK), DealerNo(FK))

**Dealer**(DealerNo, FName, LName, TelPhone, Dealerfax, AddressNo(FK))

**Address**(AddressNo, Street, Suburb, PostCode, City, ClientNo(FK), DealerNo(FK) )

**Part 3. Database design. [60 marks]**

**Please read the case study and answer the questions below.**

The Abidas Sports Company (ASC) provides online shopping. ASC requires all clients to register at first at ASC. The details stored about **clients** are client number, first and last name, postal address, home address (street number, street name, suburb, post-code, city, state) and gender. ASC offers several types of **products**. These are namely Clothing, Shoes, Accessories. The clients need to make an order before they purchase any products on the ASC website. The details, of an **order** includes client number, product number, quality, order date and time. The client will pay for their orders. The **payment** details are: issue date, client name, amount paid, product number, product name, product quantity. The client receives an invoice after they make a payment for their orders. The details of the **invoice** include invoice number, date, time, amount paid, credit card number, expiry date, CCV number of the credit card, client number. Clients can purchase products that they require at the ASC store or they can purchase the product using ASC online ordering system which allows for the products ordered to be delivered to the client address. The details of items that are **delivered** to clients are stored. These details are included delivery number, delivery fee, client name, client address, the company name that delivery and products name. The delivery service company details are stored in the ASC database. These details include **company** name, company address, fax and phone number. If a client purchases products online then the clients also can collect the products they require at ASC store. The details of the **online collection** include customer number, order details, date, time, store name, the staff who serve this collection. The client also can make a **payment for the products that the client wishes to purchase at the store.** The details of all products purchased are stored. These details are client name, store name, store address (street number, street name, suburb, post-code, city, state), staff who processed the sale, date and time of sale, product name and product price.

ASC also has many stores that distribute in Australia. The stores' information is stored in the ASC database. The information about each **store** includes the store name, location, telephone number, fax number and store number. Each store has its inventory record. The inventory details are product name, size, gender, quality, storage location (eg Bay A, Bay B, Bay C in the store). Staff can order to the ASC main warehouse to send products to them if some products have low stock inventory. Once product ordered by ASC staff is received to an ASC store, the Staff at the ASC store save the details of products received from **ASC main warehouse**. The details of products received include product name, colour, size, quality, ASC warehouse address, fax and telephone number, the staff name who receive product, date and time, ASC store name and address that received the products from ASC main warehouse. Each store records its sales every day. The details of **sales** at each ASC store include store name, store number, address, total of sale, date, time.

For each staff member the following data is stored in ASC database system: **staff** first and last name, staff number, position, salary, gender, date of birth, name of the stores he/she works in, internal telephone number and store number. The clients can browse the ASC website to find out the details of each store. If a customer finds some issues with products that they purchased, he/she then contact ASC at the following telephone number: 1800 800900. The staff at ASC once notified will recode the problem. The detail of the **records** includes the staff name, product name, colour, problem description, customer name, invoice number.

Clients can register on ASC website, can join ASC VIP loyalty membership to earn point when they purchase products from ASC. A client who is a member of the ASC VIP loyalty membership program will receive a point for each product they purchase from ASC. **VIP loyalty points** for each client is stored. The details stored about VIP loyalty points for each client is client number, points earned, the amount paid, payment date, amount payment.

**Part 3.1 (42 marks):**

1. **Identify and list all entities, attributes, primary and foreign keys of the scenario given above. Make sure that your data model is normalized to 3NF. (25 marks)**

**Clients**(ClientNo, Fname, Lname, gender, Postal, AddressNo(FK), OrderNo(FK), PaymentNo(FK))

**Products**(ProductNo, ProductName, Quantity, Price, Gender, Size, Colour, WarehouseNo(FK))

**Order**(OrderNo, ClientNo(FK), ProductNo(FK), Quality, DateTime)

**Payment**(PaymentNo, issuedate, amountpaid, ClientNo(FK), ProductNo(FK), AddressNo(FK), CreditCardNo(FK))

**Invoice**(InvoiceNo, DateTime, PaymentNo(FK), CreditCardNo(FK), ClientNo(FK))

**CreditCard**(CreditCardNo, ExpiryDate, CCV)

**Address**(AddressNo, StreetNo, StreetName, Suburb, Postcode, City, State)

**Delivery**(DeliveryNo, fee, ClientNo(FK), AddressNo(FK), CompanyNo(FK), ProductNo(FK))

**DeliveryCompany**(CompanyNo, CompanyName, fax, TelNo, AddressNo(FK))

**DeliveredItems(**DeliveryNo, fee, ClientNo(FK), CompanyNo(FK), ProductNo(FK)**)**

**OnlineCollection**(OnlinecollectionNo, ClientNo(FK), OrderNo(FK), DateTime, StoreNo(FK), StaffNo(FK))

**InStorePayment**(InStorePaymentNo, ProductNo(FK), StoreNo (FK), StaffNo(FK), DateTime)

**ASCStore**(StoreNo, StorageLocation, StoreName, ProductNo(FK), AddressNo(FK), TelNo, fax, InventoryNo(FK), StaffNo(FK), WarehouseNo(FK))

**Inventory**(InventoryNo, ProductNo(FK), StorageLocation(FK))

**Staff**(StaffNo, Fname, Lname, position, salary, gender, DOB, StoreNo(FK), TelNo, WarehouseNo(FK))

**ASCwarehouse**(WarehouseNo, ASCTelNo, StaffNo(FK), StoreNo(FK), ProductNo(FK), AddressNo(FK), fax, DateTime)

**Sales**(SalesNo, StoreNo(FK), AddressNo(FK), TotalSale, DateTime)

**Customer**(CustomerNo, Fname, Lname**)**

**Records**(RecordNo, ASCTelNo(FK), StaffNo(FK), ProductNo(FK), problemDesc, InvoiceNo, CustomerNo(FK), ClientNo(FK))

**VIPLoyalty**(LoyaltyNo, ClientNo(FK), ProductNo(FK), AmountToPay, AmountPaid, PointsEarned, PayDate)

1. **Draw an E-R diagram (including entity name, multiplicity of each relationship) based on the entities you identified above. (12 marks)**

Diagram, schematic

Description automatically generated

1. **Provide all assumptions that you made in your design. (5 marks)**

Assuming those entities that have need product name and price will also need all attributes to the product entity (e.g. name, price, quantity, productno, etc.)

Assuming complaint records include customers AND clients.

Assuming customer details are the same as client details/attributes.

Assuming Inventory entity’s attribute “gender” is relating to the gender target for the product purchased, and so the “gender” attribute was placed in the Product entity.

Assuming one credit card for one client. One credit card for one customer. One credit card for one staff member.

**Part 3.2 SQL [18 marks]**

**According to entity list above, write the following queries using SQL:**

1. **How many stores are in Canberra? (3 marks)**

SELECT Count(\*) AS myCount

FROM ASCStore

WHERE (City like ‘Canberra’);

1. **List the detail of clients who collected products from ASC on 2nd of May 2020. (3 marks)**

SELECT Clients.\*

FROM Clients, Order, ASCStore

WHERE (DateTime = ‘02/05/2020’) AND

(Clients.OrderNo=ASCStore.OrderNo) AND

(Order.ClientID=Clients.ClientID);

1. **List details of all staff who work at Canberra ASC store. (3 marks)**

SELECT Staff.\*

FROM Staff, ASCStore

WHERE (City like ‘\*Canberra\*’) AND

(Staff.City=ASCStore.City);

1. **Give all product a 30% discount. (3 marks)**

UPDATE Products

Set (Price = Price\*0.7);

1. **Display the numbers of shoes in Canberra ASC store. (3 marks)**

SELECT Product.ProductName

FROM Product, ASCStore

WHERE (Product.ProductName = ‘shoes’) AND

(City like ‘\*Canberra\*’);

1. **Display the first and last name of the customers who have put an order on 10 of May 2021 with an order price less than $50. (3 marks)**

SELECT Customer.FName, Customer.LName

FROM Customer, Orders

WHERE (DateTime = ‘10/05/2021’) AND

Orders.Price<50;

**Bibliography**

***[1]*** Week13 Review.ppt, 5915 SEM-1 2021 BRUCE ON-CAMPUS AND 6672 SEM-1 2021 BRUCE ON-CAMPUS | viewed date: 10/05/2021 | URL: <https://uclearn.canberra.edu.au/courses/10017/files/2574461/download?download_frd=1>

***[2]*** Lecture 5-2021 .ppt, 5915 SEM-1 2021 BRUCE ON-CAMPUS AND 6672 SEM-1 2021 BRUCE ON-CAMPUS | viewed date: 10/05/2021 | URL: <https://uclearn.canberra.edu.au/courses/10017/files/2388475/download?download_frd=1>

***[3]*** CheggStudy. 2021. *Database Systems 12th Edition*. [online] Available at: <https://www.chegg.com/homework-help/database-systems-12th-edition-chapter-9-solutions-9781305627482> [Accessed 10 May 2021].