I. Given the following database tables:

|  |  |  |  |
| --- | --- | --- | --- |
| **No** |  |  |  |
| **I** | **Products Table** | **Products Table** | **Bảng Sản phẩm** |
| 1 | ProductID | Product code | Mã sản phẩm |
| 2 | ProductName | Product's name | Tên sản phẩm |
| 3 | NumInStock | Quantity of products in stock | Số lượng sản phẩm tồn kho |
|  |  |  |  |
| **II** | **Customers Table** | **Customers Table** | **Bảng khách hàng** |
| 1 | CustomerID | Customer's code | Mã Khách hàng |
| 2 | CustomerName | Customer name | Tên khách hàng |
| 3 | CustomerAddress | Customer's address | Địa chỉ của khách hàng |
|  |  |  |  |
| **III** | **Invoice Table** | **Invoice table** | **Bảng hóa đơn** |
| 1 | InvoiceID | Invoice code | Mã hóa đơn |
| 2 | DateInvoice | Date of invoice | Ngày xuất hóa đơn |
| 3 | CustomerID | Customer's code | Mã Khách hàng |
|  |  |  |  |
| **IV** | **InvoiceDetails Table** | **InvoiceDetails Table** | **Bảng Chi tiết hóa đơn** |
| 1 | InvoiceID | Invoice code | Mã hóa đơn |
| 2 | ProductID | Product code | Mã sản phẩm |
| 3 | NumSold | Number of products sold | Số lượng sản phẩm đã bán |
| 4 | PriceUnit | Unit price | Đơn giá |

**II. Information and data of Database tables**

|  |  |  |  |
| --- | --- | --- | --- |
| **Products** |  |  |  |
|  | **ProductID** | **ProductName** | **NumInStock** |
|  | P01 | Dell computers | 578 |
|  | P02 | Canon printer | 752 |
|  | P03 | Panasonic projector | 463 |
|  | P04 | HP Computer | 916 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Customers** |  |  |  |
|  | **CustomerID** | **CustomerName** | **CustomerAddress** |
|  | C01 | Tran Bao Minh | Ha Noi |
|  | C02 | Le Nam Giang | Nam Dinh |
|  | C03 | Nguyen Bich Ngoc | Son La |
|  | C04 | Mac Dinh Minh | Hai Phong |

|  |  |  |  |
| --- | --- | --- | --- |
| **Invoice** |  |  |  |
|  | **InvoiceID** | **DateInvoice** | **CustomerID** |
|  | I01 | 11-09-23 | C02 |
|  | I02 | 12-09-23 | C04 |
|  | I03 | 13-09-23 | C03 |
|  | I04 | 14-09-23 | C01 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **InvoiceDetails** |  |  |  |  |
|  | **InvoiceID** | **ProductID** | **NumSold** | **PriceUnit** |
|  | I01 | P01 | 25 | 22.000.000 |
|  | I02 | P02 | 30 | 7.000.000 |
|  | I03 | P03 | 15 | 8.000.000 |
|  | I04 | P04 | 40 | 17.000.000 |

**III. Using relational algebra expression to answer below queries**

1. List customer codes and customer addresses in the customer table

πCustomerID, CustomerAddress (**Customers)**

1. List the product name and product quantity in the product table

π ProductName, NumInStock (**Products)**

1. List product codes and product names with a quantity of products in stock greater than 500 products.

πProductID, ProductName (σNumInStock>500(**Products))**

1. Find out the customer code and Invoicedate of the customer with an address in Nam Dinh.

π CustomerID, DateInvoice (σCustomerAddress = ‘Nam Dinh’ ( Invoice ⋈ Customers) )

1. List names of customers who had purchase invoices on 12-09-2023.

π CustomerName (σ DateInvoice =’12-09-2023’( Customers ⋈ Invoice))

1. List product codes and product names with unit prices greater than 10.000.000

π ProductID,ProductName (σPriceUnit>10,000,000(Products ⨝ InvoiceDetails))

1. Find out the name of the customer with an address in Son La with a purchase invoice on 13-09-2023

πCustomerName(σCustomerAddress=’Son La’(Customers) ⨝ σDateInvoice= ‘13-09-23’(Invoice))

1. List product codes and product names sold on 14-09-2023.

πProductID,ProductName (Products \* (σDateInvoice =’ 14-09-2023’(Invoice ⋈ InvoiceDetails))

1. List product codes that have never been sold

πProductID​(Products)−(πProductID​(InvoiceDetails))

1. List customer codes that have never made a purchase on 11-09-2023

πCustomerID(Customers) – (πCustomerID(σDateInvoice=‘11-09-2023’(Invoice))