

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

Bachelor of Engineering (Honours) Degree in Industrial and Manufacturing Engineering

Computer Applications – TIE 2109

FIRST SEMESTER EXAMINATIONS 2013

Time allowed: 3 hours

Instructions: Answer FIVE (5) questions.

Question 1

- a) Define the following terms commonly used in database systems. [5]
 - i. Data
 - ii. Information
 - iii. Object
 - iv. Attribute
 - v. Primary Key
- b) Briefly explain the interactions of each of the four main categories most catered for by most existing Database Management Systems (DBMSs). [8]
 - i. Data definition
 - ii. Data maintenance
 - iii. Data retrieval
 - iv. Data control
- c) State three ways in which Database Management Systems (DBMSs) can be classified. [3]
- d) Define each of the following two database models.
 - i. Object Oriented Database (OODB) [2]
 - ii. Real-Time Database (RTDB) [2]

Question 2

- a) Identify three powerful object-oriented conceptual data models for design and manufacturing. [3].
- b) Compare and contrast the three data models. [9]
- c) What does the acronym XML stand for? [1]
- d) Identify a category of engineering applications that rely on XML for conceptual data modeling. [1]
- e) Table Q2 shows three levels of data modeling, conceptual data model, logical data model, and physical data model. Show by means of a tick, the features that are contained in each model. [6]

Table Q2: Three levels of data modeling

Feature	Conceptual	Logical	Physical
Entity Names			
Entity Relationships			
Attributes			
Primary Keys			
Foreign Keys			
Table Names			
Column Names			
Column Data Types			

Question 3

- Define a product structure, stating what is usually shown on such a structure. [3]
- A product named Product 1 is shown graphically in Figure Q3 with the summarized product structure and the number of all items that are needed to make the parent products enclosed in brackets.

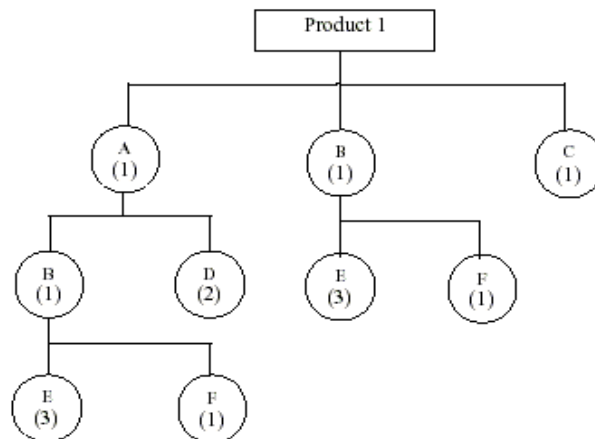


Figure Q3: Summarized product structure for product 1

- Draw a table to show a summarized Bill of Materials (BOM) for product 1. [3]
 - Illustrate an indented Bill of Materials (BOM) for product 1. [4]
 - One disadvantage of the indented BOM method is that all components of an assembly are repeated each time the assembly is used, resulting in massive duplication of data. Suggest one possible solution to the duplication problem and draw tables to illustrate your solution to product 1. [6]
- Define the following terms which relate to advanced engineering applications for databases.
 - Product Data Management (PDM) system [2]
 - Product Life Cycle Management (PLM) [2]

Question 4

- Explain what the following statement means:
*“Visual Basic 2005 application acts as a **front-end** to the database”* [2]

- b) Illustrate by means of a flow diagram how the user can interact with a database through a VB 2005 programming platform. [4]
- c) Identify and briefly explain five categories of objects provided in Visual Basic 2005 that allow interaction with databases. [5]
- d) Visual Basic 2005 supports several database types; hence it offers several different connection objects: **OleDbConnection**, **SqlConnection**, **OdbcConnection**, **OracleConnection**.
- State four object properties of the **OleDbConnection** object. [4]
 - A Visual Basic interface for accessing the “Titles” table in the “Books” database has four textboxes and the name property for each textbox and the associated table column are shown in Table Q4 below.

Table Q4

Text box Name	Associated Table Column
txtTitle	Title
txtYearPublished	Year_Published
txtISBN	ISBN
txtPubID	PubID

Write four Visual Basic 2005 code statements to bind text box controls to the “Titles” data table. [4]

- Identify an object which enables data table navigation in VB 2005. [1]

Question 5

- What does the acronym SQL stand for? [1]
- Write SQL statements to express the following statements.
 - If the cost of freight is greater than or equal to \$500.00, it will be taxed by 10%. Create a report based on the “Orders” table to show the Order_ID, Freight_Cost, freight cost with this tax for all orders of \$500 or more. The taxed freight cost should have the column title “Freght_Total”. [4]
 - Create a report showing the title of courtesy and the first and last name of all employees in the “Employees Table” whose title of courtesy begins with “M”. [4]
 - Identify and give a brief description of each of the five aggregate functions used to calculate results using field values from multiple records. [5]
- Write VB 2005 code to perform the following tasks.
 - Declare an OLED command object called “TitlesCommand” [2]
 - Establish the command object using a query that retrieves all records from the “Titles” table based on the “BooksConnection” object. [2]
 - Dispose of the command object. [2]

Question 6

- a) Define an array. [2]
- b) Identify two types of arrays. [2]
- c) A bidimensional array can be imagined as a bidimensional table made of elements, all of them of a same uniform data type. An array `jimmy` represents a bidimensional array of 3 per 5 elements of type `int`.
 - i. Write a C++ expression to declare the array 'jimmy'. [2]
 - ii. Draw a bidimensional table to represent the array 'jimmy', showing the array indices to identify the elements. [3]
- d) Write a C++ program to display the following report shown in Figure Q6;

```
Please type 10 integers.
Number 1: 120
Number 2: 42
Number 3: 75
Number 4: 38
Number 5: 904
Number 6: 6
Number 7: 26
Number 8: 55
Number 9: 92
Number 10: 20

The sum of these numbers is 1378
```

Figure Q6: Report output

Please note that the integers after the colon are shown for illustration purposes only as the user can type in any integers of their choice. Your program must prompt the user with the statement, (*Please type 10 integers*). Declare an integer constant called 'max' with a value of 10, declare an integer array called 'number' with size 'max', and then use a 'for' loop with integer 'i' to track the user's entries to a maximum limit of 10. After entering all the 10 integers, the program must sum the numbers and print out the last statement shown on Figure Q6. [11]

END OF EXAM