

BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 6 Professional Graduate Diploma in IT

ADVANCED DATABASE MANAGEMENT SYSTEMS

Monday 26th September 2016 - Afternoon

Answer **any** THREE questions out of FIVE. All questions carry equal marks.

Time: THREE hours

**Answer any Section A questions you attempt in Answer Book A
Answer any Section B questions you attempt in Answer Book B**

The marks given in brackets are **indicative** of the weight given to each part of the question.

Calculators are NOT allowed in this examination.

SECTION A

Answer Section A questions in Answer Book A

A1

Triggers can act as a type of procedural integrity constraint that extend SQL and are supported in most DBMS products.

- a) Explain what a trigger is used for and how it differs from a traditional declarative integrity constraint. **(5 marks)**
- b) Describe how a Trigger differs from a stored procedure, another procedural extension to SQL **(4 marks)**
- c) Refer to the program listing and tables below (Fig A1). This listing represents pseudocode for a trigger that operates on the tables Parts and ReorderStock.
From examination of the trigger code explain:-
 - i) What business rule is enforced. **(3 marks)**
 - ii) How the trigger works, giving examples using the sample tables, of the circumstances in which it would execute and enforce the business rule. **(5 marks)**
 - iii) How removing the `WHEN` clause and performing the test within the trigger code instead, affects the way in which the trigger works. **(3 marks)**

- d) Identify and describe a potential flaw in the logic of the trigger code and explain how the trigger could be improved to overcome this flaw.

(5 marks)

Fig A1 Trigger Code and Sample Tables

```

CREATE TRIGGER st_order_trg AFTER UPDATE OF qty_in_stock ON parts
FOR EACH ROW
WHEN (NEW.qty_in_stock < NEW.reorder_level)
DECLARE
  x NUMBER;
BEGIN
  SELECT COUNT(*) INTO x
  FROM reorderstock
  WHERE partid = :NEW.partid;

  IF x = 0 THEN
    INSERT INTO reorderstock
    VALUES (:NEW.partid
            ,SYSDATE
            ,:OLD.reorder_qty )
  END IF;
END;

```

Table Parts

PartID	StockDetail	Qty_In_Stock	Reorder_level	Reorder_Qty
1	Drill	450	500	50
2	Hammer	50	60	20
3	Mallet	29	20	5
4	Chisel	149	150	20

Table ReorderStock

PartID	OrderDate	QtyOrdered
1	08/09/12	50
3	12/09/12	10

A2

Study the following scenario:

RSS (Really Simple Syndication) is a way of transmitting XML files that contain news content originating from various web sites that are made available to multiple other sites. Syndication refers to making web feeds available from a news site in order to provide other people with a summary or update of the website's recently added content (for example, the latest news or forum posts).

- a) List FOUR characteristics of XML that make it possible to exchange data containing news content/feeds over the WWW.
(4 marks)
- b) Define XSLT and XPath and outline how they could be used in the RSS application described in the scenario above
(7 marks)
- c) Explain how the following program (Fig A2) achieves the function of creating an XML document from a RSS feed. Use the line numbers provided to reference the code.
(8 marks)

Fig A2 Program extract that generates RSS feeds from a web site <http://www.anynews.co.uk>.

```
10 Connection db= DriverManager.getConnection(url,loginpassw);
11 Query = "SELECT * FROM news WHERE source = ?";
12 PreparedStatement ps = db.prepareStatement(Query);
13 ps.setString(1, source);
14 ResultSet rs = ps.executeQuery();
15 System.out.println("<rss version\*2.0\>channel>");
16 System.out.println("<title>Originally a ABC Newsfeed</title>");
17 System.out.println("<link>http://www.anynews.co.uk/news</link>");
18 System.out.println("<description>major earthquake ,</description>");
19 While(rs.next()) (
20     System.out.println("<item>");
21     System.out.println("<title>"+rs.getString('title') + "</title>");
22     System.out.println("<link>http://www.anynews.co.uk/news/link.php?id=" +
23         rs.getString(<id" + </link>");
24     System.out.println(" <description>"+ rs.getString("description")+
25         "<description>>");
26     Syatem,out.println("</item>");
27 )
28     System.out.printlb("Channel>/rss>");
```

- d) XML is regarded as a 'document oriented database description language' (abbreviated to DODDL). A DODDL describes the data used in one of the main categories of non-relational databases. Their popularity has grown in parallel with the growth of the volume of data that is consumed on the WWW.

Describe the differences between a DODDL and the Data Description Language of a traditional relational database. **(6 marks)**

A3

- a) Given the following three linked tables in which primary key columns are underlined and foreign key columns are labelled with an asterisk (*) :

Customers (custID, name, country)

Products (prodID, price)

Orders (orderID, custID*, prodID*, o_date)

and the following query:

```
SELECT Customers.name
FROM Customers, Orders, Products
WHERE Customers.custID = Orders.custID
AND Orders.prodID = Products.prodID
AND Orders.o_date = '15-Sep-2016'
AND Products.price > 100;
```

Suppose this query is run by executing the following sequence of steps:

1. R1 = Join of Customers and Orders
2. R2 = Join of Products and R1
3. R3 = Selection (date = '15-Sep-2016') from R2
4. R4 = Selection (price > 100) from R3
5. R5 = Projection (name) from R4

- (i) What is the problem caused if the query is executed based on the sequence above.

(2 marks)

- (ii) Suggest a new sequence that will make the query more efficient. You would need to introduce extra steps and not simply re-arrange the existing steps.

(8 marks)

b) Suppose there is an index on the column “country” of the “Customers” table above. Explain how this index could be used when executing each of the following queries:

(i) `SELECT *`
`FROM Customers`
`WHERE country = 'India';`

(2 marks)

(ii) `SELECT*`
`FROM Customers`
`ORDER BY country;`

(2 marks)

(iii) `SELECT COUNT(country)`
`FROM Customers;`

(3 marks)

c) Almost every database system provides a mechanism for enforcing a password policy that has the following features:

- Complexity
- Failed attempts
- Expired passwords
- Password reuse

Briefly describe each of the above features and explain how they help protect the database.

(8 marks)

SECTION B

Answer Section B questions in Answer Book B

B4

a) Data warehouses are conceptually 'warehouses of data' – but not just any data. Before entering the warehouse, data must pass through the COLLECT > CLEAN > COLLATE cycle. A more common acronym is 'ETL'. For each of the following three stages, using your own simple examples and/or diagrams, explain the key issues and concepts at stake and how the 'ETL' process maps onto this three-part process.

(i) Data collection (5 marks)

(ii) Data cleansing (5 marks)

(iii) Data collation (5 marks)

b) Once the warehouse is populated with quality data, it must be accessible to a wide range of professional data analysts and end-users. Different users will require different interfaces, each offering different features and functionality. Using your own simple examples and/or diagrams, explain and describe the range of interfaces available.

(10 Marks)

B5

Imagine you are a database consultant who has been asked to answer the following questions posed by a potential client.

Using your own simple examples and/or any suitable diagrams show how you would address the questions posed by the client

(i) What is the difference between a query, statement & transaction? (5 marks)

(ii) Do transactions have to conform to any rules? (5 marks)

(iii) What is database locking used for? (5 marks)

(iv) How does a database undo a mistaken change to data? (5 marks)

(v) How does a database plan and monitor multiple actions at the same time? (5 marks)