SECTION A

Answer ALL the questions in this section only if you studied **Delphi**.

SCENARIO

Water is one of the most essential commodities required for the survival of human beings, plants and animals. The Department of Water Affairs is embarking on an intensive campaign to help save water. Many measures and programmes have been put in place to help bring about awareness on how to use water sparingly.

QUESTION 1: DELPHI PROGRAMMING AND DATABASE

The Department of Water Affairs has created a database named **DamsDB** containing information on all the dams in the country and the towns to which they supply water. An incomplete program has been developed to process queries on the data in the **DamsDB** database. Your task will be to complete this program.

The database named **DamsDB**, as well as an incomplete Delphi project named **Question1_P.dpr**, are saved in the folder named **Question1_Delphi**.

NOTE: The design of the tables in the **DamsDB** database and the sample data for this question can be found in **ADDENDUM A: Table Description Sheet**.

NOTE: If you cannot use the database provided, follow the instructions in **ADDENDUM B** to create the database before you answer any of QUESTIONS 1.1 to 1.7.

NOTE: Make a copy of the **DamsDB** database BEFORE you start with the solution. You will need a copy of the original database to be able to test your program thoroughly.

Do the following:

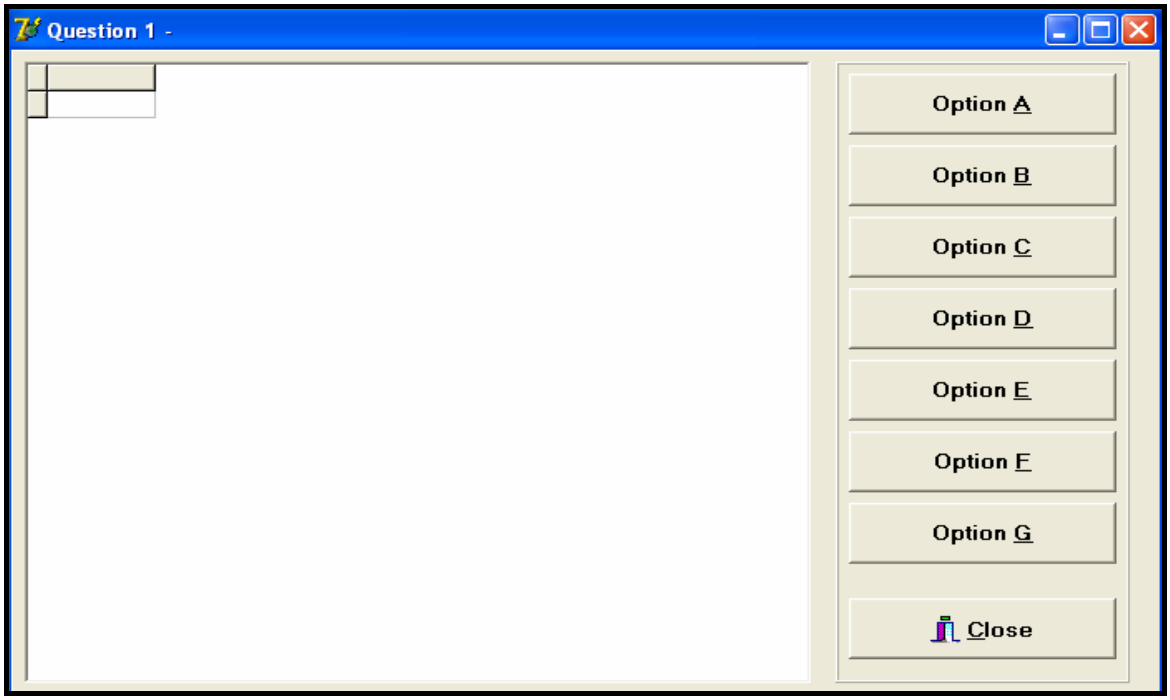
- Rename the folder **Question1_Delphi** as **Question1_X**, where X should be replaced with your examination number.
- Open Delphi and then open the file **Question1_P.dpr** in the folder **Question1_X**. The program displays eight buttons as well as a DBGrid that will be used as an output component (see example on the next page).
- Add your examination number to the right of 'Question 1 –' in the caption of the form.
- Go to 'File/Save As …' and save the main unit as **Question1_UXXXX** (where XXXX must be replaced with the last FOUR digits of your examination number).
- Go to 'File/Save Project As …' and save the project as **Question1_PXXXX** (where XXXX must be replaced with the last FOUR digits of your examination number).
- The program should be able to connect to the database named **DamsDB**. When you do QUESTION 1.1 (on the next page) and you find that the connectivity is not in place, use the steps supplied in **ADDENDUM C** to establish connectivity with the database.

NOTE: If your program cannot connect to the database, make sure that the database file **DamsDB** is in the same folder as your program. If this is not the case, copy the database file **DamsDB** into the same folder as your program. Your program will not work if the database file is in a folder other than the folder containing your program.

NOTE: If you still cannot establish connectivity with the database when you execute the program, you must still do the SQL code and submit it for marking.

Marks will only be awarded for the programming code which contains the SQL statements in the unit named Question1_UXXXX.

When you execute the program, the interface below will be displayed. An error will be displayed when you click the buttons, due to the incomplete SQL statements.



Do the following:

Complete the SQL statements in **Question1_UXXXX.pas** for each button, as indicated in QUESTIONS 1.1 to 1.7 below. The code to execute the SQL statements and to display the results in the DBGrid has been given to you. You only need to complete the SQL statements and some input statements, as required in the **Question1_UXXXX** unit.

1.1 The Department of Water Affairs wants a list of all the dams in the country, sorted according to the height of the dam walls from the lowest to the highest. Complete the code for the **Option A** button by formulating an SQL statement to display **all the details** of dams stored in the **tblDams** table, sorted as required.

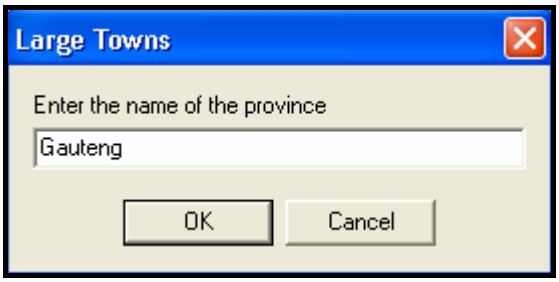
Example of the output for the first seven records:

DamID	DamName	River	YearCompleted	DamLevel	Capacity	HeightOfWall
83	Lake Mzingazi Dam	Mzingazi River	1942	19678	37000	8.2
146	Vaal Barrage	Vaal River	1922	48897	56712	10.3
34	Douglas Weir	Vaal River	1977	5910	16700	10.6
152	Voëlvlei Dam	Voëlvlei River	1971	131302	158600	10.6
41	Emmarentia Dam	Braamfontein Spruit	1912	151	250	11.4
68	Klipdrif Dam	Loop Spruit	1918	4629	13300	12.2
148	Vaalharts Storage Weir	Vaal River	1936	24105	48700	12.5

: (3)

1.2 One of the main concerns is large urban towns. The Department wants a list of all towns in a particular province that have a population exceeding 100 000. Complete the code for the **Option B** button by asking the user to enter the name of the province. Formulate an SQL statement to display the **TownName** and **Population** of all the towns that have a population exceeding 100 000 in the designated province.

Example of the input and output of all the towns in **Gauteng** with a population exceeding 100 000:



TownName	Population
Johannesburg	1975500
Tshwane	1473800
Vanderbijlpark	338000

(6)

1.3 An audit of the dams is taking place and additional information (not stored in the table) is required. You must write a query to display the age of each dam, as well as the current water level of each dam, as a percentage of its capacity. The age of a dam is calculated by subtracting **YearCompleted** from the current year. Call this field **Age**. The current water level of a dam as a percentage of its capacity can be calculated using the fields **DamLevel** and **Capacity**. Call this field **Percentage** and round it down to ONE decimal place. Complete the code for the **Option C** button by formulating an SQL statement to display the **DamID**, **DamName** and the two calculated fields.

Example of the output for the first seven records:

DamID	DamName	Age	Percentage
1	Albasini Dam	59	71.1
2	Albert Falls Dam	35	49.4
3	Allemanskraal Dam	51	73.7
4	Alphen Dam	21	33.9
5	Armenia Dam	57	54.3
6	Beervlei Dam	54	58.8
7	Berg River Dam	4	88.4

: (7)

1.4 The Department of Water Affairs considers any town with water restrictions to be a 'critical town' and wants to know how many critical towns there are in each province. Complete the code for the **Option D** button by formulating an SQL statement that will display the **Province** and a **calculated field** for **the total number of critical towns** in that province. Name the calculated field **CriticalTowns**.

Example of the output:

Province	CriticalTowns
Eastern Cape	11
Free State	6
Gauteng	3
KwaZulu-Natal	11
Limpopo	7
Mpumalanga	11
North West	5
Northern Cape	3
Western Cape	15

(5)

1.5 Due to the fact that the Vaal River flows through a number of provinces, the Department needs to know which provinces would be affected, should the Vaal River be contaminated by pollution. A province is supplied with water by the Vaal River if the dam that supplies a town in the province with water, receives water from the Vaal River. Complete the code for the **Option E** button by formulating an SQL statement to display the names of all the provinces that are supplied with water by the Vaal River. The name of each province should appear in the list only ONCE.

Example of the output:

Province
Free State
Gauteng
Mpumalanga
North West
Northern Cape

(7)

1.6 Some analysts have indicated that the **North West** province will experience severe droughts in the coming years. They have recommended that water restrictions be imposed on all towns in this province, which means they will all become critical towns. Complete the code for the **Option F** button by formulating an SQL statement that will **update** the records of all towns in the North West province to show which towns have water restrictions.

Example of the output (on the next page):

HINT: Run **Option D** to verify that the records have been updated. There should be 13 critical towns in the North West province after Option F has been executed. (4)

1.7 The risk of flooding has been assessed and it is recommended that all dams with a dam wall height of less than 11,50 metres may not be used any longer. Complete the code for the **Option G** button by formulating an SQL statement to delete the record of all dams from the **tblDams** table that have a dam wall height (**HeightOfWall)** of less than 11,50 metres.

Example of the output:

HINT: Run **Option A** to verify that the records have been deleted. (3)

- Enter your examination number as a comment in the first line of the file named **Question1_UXXXX.pas** containing the SQL statements.
- Save the main unit **Question1_UXXXX** and the project **Question1_PXXXX** (File/Save All).
- A printout of the code for the **Question1_UXXXX.pas** file will be required. **[35]**