GALGOTIAS UNIVERSITY

School of Computing Science and Engineering

Program: BCA - IOP

Course Code: BCAS3031

Course Name: PL/SQL & Cursors and Triggers

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Associate Professor

Course Outcomes :

Course outcomes (COs)	
CO1	Understand the basic concepts of PL/SQL
CO2	Enumerate PL/SQL code constructs using looping structures
CO3	Solve database problems using the concept of cursors and triggers
CO4	Distinguish the structure of packages, collections and records
CO5	Construct programming skills for handling exceptions.
CO6	Acquire hands-on experience with case studies

Syllabus

Unit I **Introduction to PL/SQL** **8 hours**

List the different Types of Identifiers in a PL/SQL subprogram, Usage of the Declarative Section to Define Identifiers, Use of variables to store data, Scalar Data Types, %TYPE Attribute, Bind Variables, Sequences in PL/SQL Expressions, Basic PL/SQL Block Syntax Guidelines, SQL Functions in PL/SQL, Data Type Conversion, Nested Blocks, Operators in PL/SQL, SELECT Statements in PL/SQL to Retrieve data, Data Manipulation in the Server Using PL/SQL, How to save and discard transactions

Unit II **Conditional Statements and Procedures** **8 hours**

Conditional processing Using IF Statements, Conditional processing Using CASE Statements, Simple Loop Statement, While Loop Statement, For Loop Statement, The Continue Statement, Composite Data Types, PL/SQL Records, The %ROWTYPE Attribute, Insert and Update with PL/SQL Records, Associative Arrays (INDEX BY Tables), INDEX BY Table Methods, INDEX BY Table of Records, Procedure, Create a Simple Procedure; Create a Simple Procedure with IN parameter, Function, Create a Simple Function.

Unit III **Cursor and Trigger** **8 hours**

Cursor, Declare the Cursor, Cursor Attributes, Cursor Variables, Cursor Expressions, Fetching data from the Cursor, Cursor FOR loop, Explicit Cursors, Explicit Cursor Attributes, FOR UPDATE Clause and WHERE CURRENT Clause, Triggers, Trigger Architecture, Trigger types, Sample trigger with example, Trigger concept.

Unit IV **Packages, Collections and Records** **8 hours**

Packages, Package Architecture, Package Specifications, %TYPE and %ROWTYPE, Advantages of Package, Overview of Collections and Records: Structure of Varray and Nested Table, Initializing, Referencing and Comparing Collections, Operations on Collections and Varray, Manipulation in nested Table and Varray, PL/SQL Table.

UNIT V **Exception Handling** **6 hours**

Exception Handling, Handle Exceptions with PL/SQL, User-Defined Exception, RAISE_APPLICATION_ERROR, Exceptions raised in Declarations, SQLCODE and SQLERRM.

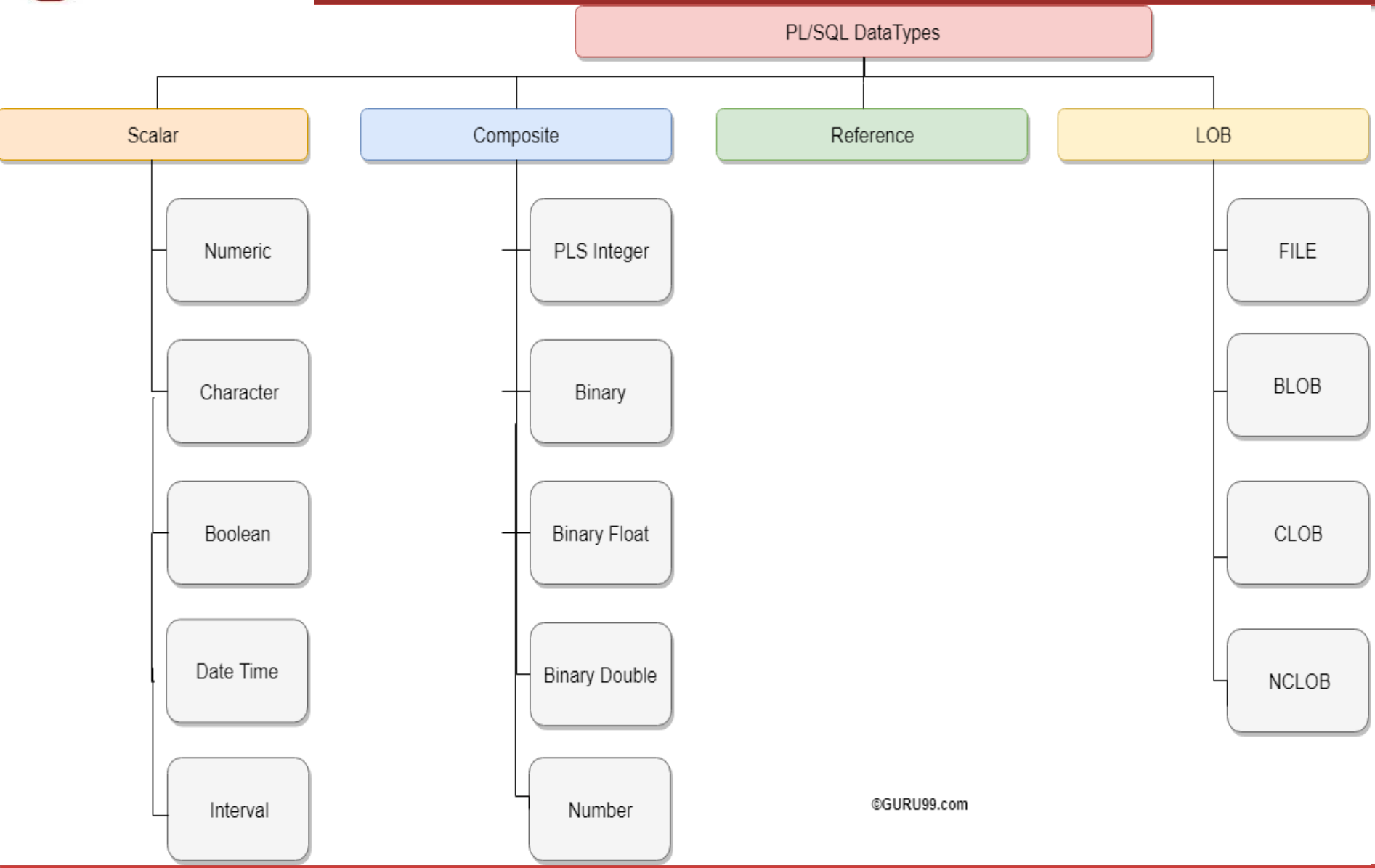
UNIT VI **Case Studies** **6 hours**

Payroll Processing System, Gas booking and delivering, Conducting online Quiz, Bank transaction, Library information system, Electricity bill processing, Material requirement processing, Railway reservation system, Web based user identification system

PL/SQL Data Types: Boolean, Number, Date

- A data type is associated with the specific storage format and range constraints. Each value or constant is assigned with a data type.
- It defines how the data is stored, handled and treated during the data storage and processing.
- The main difference between PL/SQL and SQL data types is, SQL data type are limited to table column while the PL/SQL data types are used in the PL/SQL blocks.

- Every programming language has built-in data types which are used for declaring variables and many other related tasks.
- Variable is nothing but the name of the memory space.
- Every variable has a data type which specifies the storage format, set of specified values, range of the variable and many other such factors.


PL/SQL DataTypes
Scalar
Composite
Reference
LOB
Numeric
Character
Boolean
Date Time
Interval
PLS Integer
Binary
Binary Float
Binary Double
Number
FILE
BLOB
CLOB
NCLOB
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- CHARACTER Data Type
- NUMBER Data Type
- BOOLEAN Data Type
- DATE Data Type
- LOB Data Type

CHARACTER Data Type:

- This data type basically stores alphanumeric characters in string format.
- The literal values should always be enclosed in single quotes while assigning them to CHARACTER data type.
- This character data type is further classified as follows:
  - CHAR Data type (fixed string size)
  - VARCHAR2 Data type (variable string size)
  - VARCHAR Data type
  - NCHAR (native fixed string size)
  - NVARCHAR2 (native variable string size)
  - LONG and LONG RAW

NUMBER Data Type:

- This data type stores fixed or floating point numbers up to 38 digits of precision.
- This data type is used to work with fields which will contain only number data.
- The variable can be declared either with precision and decimal digit details or without this information.
- Values need not enclose within quotes while assigning for this data type.

```
A NUMBER(8,2);
B NUMBER(8);
C NUMBER;
```

- The first declaration declares the variable 'A' is of number data type with total precision 8 and decimal digits 2.

- The second declaration declares the variable 'B' is of number data type with total precision 8 and no decimal digits.

- The third declaration is the most generic, declares variable 'C' is of number data type with no restriction in precision or decimal places. It can take up to a maximum of 38 digits.

BOOLEAN Data Type:

- This data type stores the logical values.
- It represents either TRUE or FALSE and mainly used in conditional statements.
- Values need not enclose within quotes while assigning for this data type.

Var1 BOOLEAN;

Syntax Explanation:

• variable 'Var1' is declared as BOOLEAN data type. The output of the code will be either true or false based on the condition set.

DATE Data Type:

- This data type stores the values in date format, as date, month, and year.
- Whenever a variable is defined with DATE data type along with the date it can hold time information and by default time information is set to 12:00:00 if not specified.
- Values need to enclose within quotes while assigning for this data type.
- The standard Oracle time format for input and output is 'DD-MON-YY' and it is again set at NLS_PARAMETERS (NLS_DATE_FORMAT) at the session level.

```
newyear DATE:='01-JAN-2015';
current_date DATE:=SYSDATE;
```

Syntax Explanation:

- variable 'newyear' is declared as DATE data type and assigned the value of Jan 1st, 2015 date.
- The second declaration declares the variable current_date as DATE data type and assigned the value with current system date.
- Both these variable holds the time information.

LOB Data Type:

- This data type is mainly used to store and manipulate large blocks of unstructured data's like images, multimedia files, etc.
- Oracle prefers LOB instead of the a LONG data type as it is more flexible than the LONG data type.

The below are the few main advantages of LOB over LONG data type.

- The number of column in a table with LONG data type is limited to 1, whereas a table has no restriction on a number of columns with LOB data type.
- The size of the LONG column is 2GB, whereas LOB can store up to 128 TB.
- Oracle is constantly improving the LOB data type in each of their releases according to the modern requirement, whereas LONG data type is constant and not getting many updates.

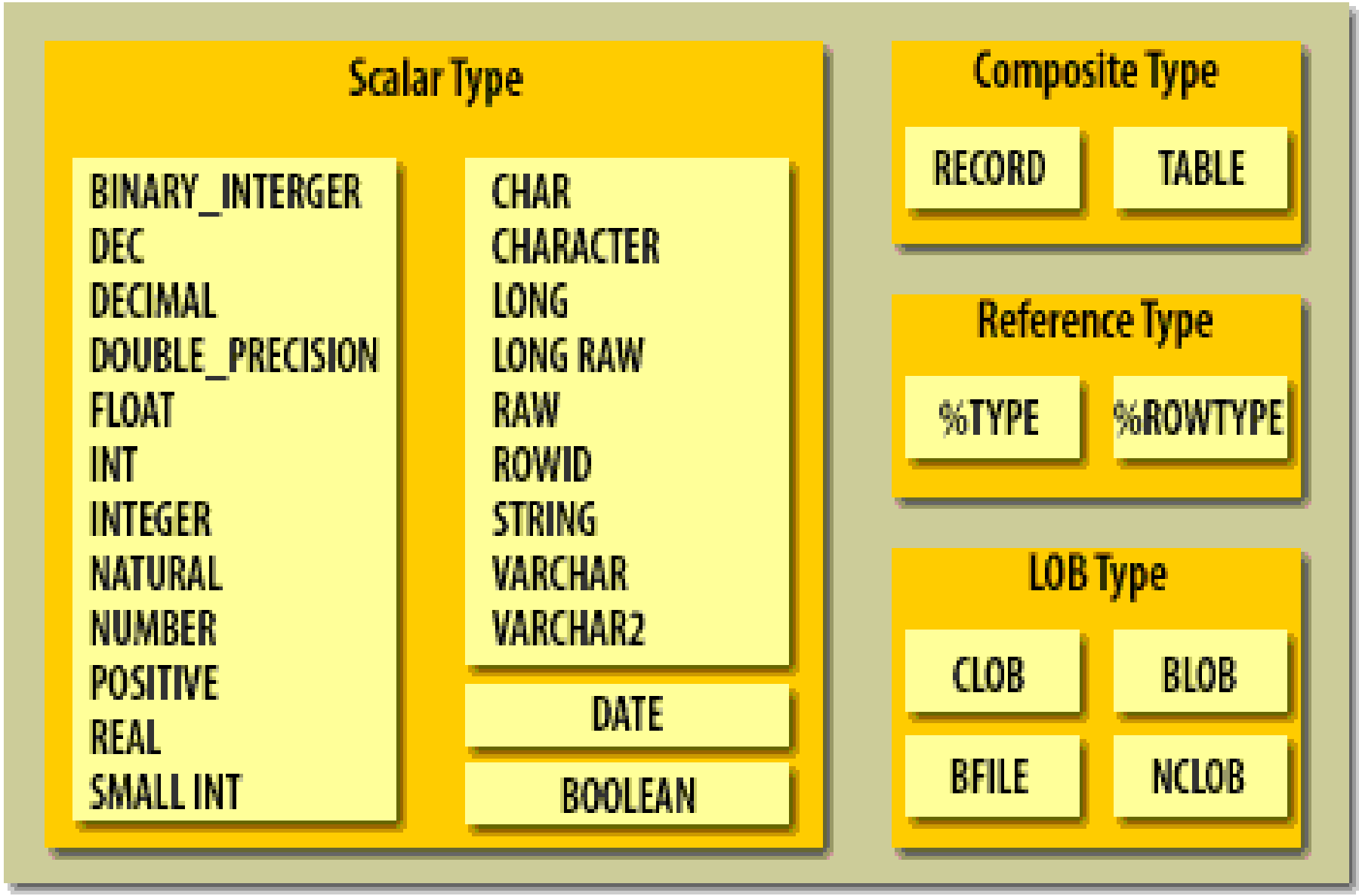
- BLOB
- CLOB and NCLOB
- BFILE

BLOB	This data type stores the LOB data in the binary file format up to the maximum size of 128 TB. This doesn't store data based on the character set details, so that it can store the unstructured data such as multimedia objects, images, etc.

CLOB and NCLOB	CLOB data type stores the LOB data into the character set, whereas NCLOB stores the data in the native character set. Since these data types use character set based storage, these cannot store the data like multimedia, images, etc. that cannot be put into a character string. The maximum size of these data types is 128 TB.

BFILE	•BFILE are the data types that stored the unstructured binary format data outside the database as an operating-system file. •The size of BFILE is to a limited operating system, and they are read-only files and can't be modified.

PL/SQL Datatypes



1. Scalar: These data types don't include any internal components. It includes data types such as NUMBER, DATE, BOOLEAN, etc.

2. Large Objects (LOB): This type of data type stores objects that are relatively large in size and stored separately from other data types such as text, graphic images, video clips, sound, etc.

3. Composite: These type of data types have internal components that can be accessed individually. It includes records and collections.

4. Reference: As the name sounds, it includes pointers that refer to the location of the other data items.

1. Numeric: Numeric values on which arithmetic operations are performed. It includes sub types such as number, decimal, real, float, etc.

2. Character: Character values on which character operations such as strings are performed. It includes sub types such as char, varchar, varchar2, nvarchar2, etc.

3. Data and Time: This data type is used to store fixed data type which displays and saves time and date values. The default data format saved into the database might be 'DD-MM-YY'. However, you can change and alter the position of the terms accordingly.

4. Boolean: These include logical values on which logical operations are performed. The logical values are the Boolean values TRUE and FALSE and the value NULL. But, SQL has no data type equivalent to BOOLEAN. It cannot be used in SQL Statements, built in SQL functions such as To_char, PL/SQL function invoked from DQL commands.

5. Number: Syntax: Number(Precision, Scale). Fixed-point or floating-point number with absolute value in range 1E-130 to (but not including) 1.0E126. A NUMBER variable can also represent 0.

6. Float: ANSI and IBM specific floating-point type with maximum precision of 126 binary digits (approximately 38 decimal digits).

7. Integer: ANSI and IBM specific integer type with maximum precision of 38 decimal digits

8. Real: Floating-point type with maximum precision of 63 binary digits (approximately 18 decimal digits).

9. Varchar2: Variable-length character string with maximum size of 32,767 bytes.

10. Rowid: Physical row identifier, the address of a row in an ordinary table.

11. Bfile: Used to store large binary objects in operating system files outside the database System-dependent. Cannot exceed 4GB.

12. Blob: Used to store large binary objects in the database. Memory Capacity: 8 to 128 TB.

13. Clob: Used to store large blocks of character data in the database. Memory Capacity: 8 to 128 TB.

14. Nclob: Used to store large blocks of NCHAR data in the database. Memory Capacity: 8 to 128 TB.

https://www.thecrazyprogrammer.com/plsql-programs-examples


Thank You