SQL (Structured Query Language)

A language which is used to create, construct, manipulate and manage/control relational database.SQL is an interactive, interpreted language.

SQL includes at least three different types of languages. It supports procedural and non-procedural programming.

DDL – **D**ata **D**efinition **L**anguage - creation

DML – **D**ata **M**anipulation **L**anguage – construction and manipulation.

DCL – **D**ata **C**ontrol **L**anguage - Managing and controlling the database.

Procedural – how to do? – (procedures and functions)

Non-procedural – what to do?-(insert, update, delete and select).

Interfaces/classes to write Database applications in Java.

Connection Interface

Connection object is instantiated to make a connection to a specific database using a specific driver.Different connections can be created to different database .This offers great opportunity for developing applications on data that reside in multiple databases.

DriverManager class – Has functions that establishes the connection between java application and Database system.

Statement Interface – To send SQL queries to the database system through the connection object.

Prepared Statement Interface - is a subclass of Statement interface.It is used to execute precompiled SQL statements. For faster and efficient statement execution.

ResultSet- When SQL retrieval statement is used, the data returned by the database System is stored in ResultSet objects.ResultSet is actually a container for the result of a query.

Writing a Database Application in Java.

The Steps followed are

- ✓ Import java.sql package
- ✓ Load and register the driver that supports interaction with the database System.
- ✓ Establishment of connection to a database residing inside a database server by creating connection object.
- ✓ Querying the database by sending the queries as statements by creating statement objects through the connection object created
- ✓ Creating a ResultSet object incase the database system returns a set of records/tuples.
- ✓ Close the statement
- ✓ Close the connection

Step 1:
import
The java.sql package can be imported into java application using java.sql.*;
Step2:
Load a JDBC Driver
The Class.forName() is the most common and easiest method to load the driver.The method takes the complete package name of the driver as its argument.The function throws a checked exception ClassNotFoundException and has to be caught.

Loading The JdbcMysqlDriver

```
try
    {
      Class.forName ("com.mysql.jdbc.Driver");
     } catch (ClassNotFoundException err) {System.out.println (err) ;}
```

Step3:
The standard method of establishing connection to a database is to call DriverManager.getConnection method, once a driver is loaded.

Establishing connection to mysql server.

```
Connection con;
String con_string = "jdbc: mysql: //localhost:3306/e"
try
    {
        Class.forName ("com.mysql.jdbc.Driver");
       con=DriverManager.getConnection (con_string,"root","amirtha");
     } catch (ClassNotFoundException err) {System.out.println (err) ;}
     catch (SQLException err) {System.out.println (err)  }
```

Step4:Create statement object.
Once the connection is established,the java application talks/interacts with the database by passing the query using Statement object.
Statement stmt = con.createStatement();
There are three types of statement objects:
Statement - Execute a constant query string(query with constant values)
PreparedStatement-Precompiled statement supplied with values during runtime.
Callable Statement – Execute procedures and functions.

Step 5:Execute the Statement
Execute(String)-execute the given sql statement that returns multiple sets.
executeQuery(String) – execute the query that returns a single result set.
executeUpdate()- Execute insert,update and delete queries.

step5:Process the resultset
The records obtained from database are processed in the java application using ResultSet object.If the ResultSet is obtained using the createStatement above is forward only i.e,changes cannot be made from java application to database.

Methods of ResultSet Object are

getXXX series
XXX can be replaced with
Int
Byte
String
Long
Double
Float and so on
Example
Rs.getInt(arg1 ,arg2) where rs is object of resultset arg1 is the field info and arg2 is the value of the field
next() – to iterate through the ResultSet object.

Step 6: **close the statement.**
Close the concerned statement,when it is no longer in use.
Step7: **close the connection.**
When connection is no longer used.commit all the changes made to the database from front end by executing the commit function and close the connection object by executing a close function.
con.commit(); con.close();

More on PreparedStatement:
setXXX series of functions is used to set values to the fileds of the table in the underlining database from java application.
setXXX – XXX is replaced by Long,Byte,Int,String and,son on.

Servlet Programs

Program 1: Processing ResultSets in a Servlet application

```
/* Retrieving records from database(student table) using servlet program and displaying in a table */


import java.io.IOException;
```

```
import java.io.PrintWriter;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import java.sql.*;

public class RetrieveFromStudent extends HttpServlet {

   protected void processRequest(HttpServletRequest request, HttpServletResponse
response)
         throws ServletException, IOException {
      Connection con;
      String url = "jdbc:mysql://localhost:3306/vit";
      Statement st;
      ResultSet rs;
      response.setContentType("text/html;charset=UTF-8");

      try (PrintWriter out = response.getWriter()) {
         out.println("<!DOCTYPE html>");
         out.println("<html>");
         out.println("<head>");
         out.println("<title>Servlet Retrieve Data from Student</title>");
         out.println("</head>");
         out.println("<body>");
         try
         {
            Class.forName ("com.mysql.jdbc.Driver");
            out.println("Driver loaded");
            con=DriverManager.getConnection (url,"hema","hema");
            out.println("Connected to DB");
            st = con.createStatement();

            String query = "select * from student";
            rs  = st.executeQuery(query);

            out.println("<table>");
            out.println("<tr>");
            out.println("<th>Register Number</th>");
            out.println("<th>Name</th>");
            out.println("<th>DOB</th>");
            out.println("<th>CGPA</th>");
            out.println("</tr>");
            while (rs.next())
            {
```

```
                int regno = rs.getInt("regno");
                String name = rs.getString("name");
                String dob = rs.getString("dob");
                float cgpa = rs.getFloat("cgpa");
                //out.println(regno+name + dob+cgpa);
              out.println("<tr>");
              out.println("<td>"+regno+"</td>");
              out.println("<td>"+name+"</td>");
              out.println("<td>"+dob+"</td>");
              out.println("<td>"+cgpa+"</td>");
              out.println("</tr>");

              }
              out.println("</table>");
           }   catch (ClassNotFoundException err) {out.println (err) ;}
              catch (SQLException err) {out.println (err);  }
           out.println("</body>");
           out.println("</html>");
       }
    }
}
```

Program2

```
/* Access Form Data and Insert into Student table using Servlet program */

import java.io.IOException;
import java.io.PrintWriter;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import java.sql.*;

public class InsertIntoStudent extends HttpServlet {

   protected void processRequest(HttpServletRequest request, HttpServletResponse
response)
          throws ServletException, IOException {
       Connection con;
       String url = "jdbc:mysql://localhost:3306/vit";
       PreparedStatement pst;
       response.setContentType("text/html;charset=UTF-8");


       try (PrintWriter out = response.getWriter()) {
```

```
        /* TODO output your page here. You may use following sample code. */
        out.println("<!DOCTYPE html>");
        out.println("<html>");
        out.println("<head>");
        out.println("<title>Servlet Student</title>");
        out.println("</head>");
        out.println("<body>");
        out.println("<h1>Servlet Student at " + request.getContextPath() +
"</h1>");

        try
        {
           Class.forName ("com.mysql.jdbc.Driver");
           out.println("Driver loaded");
           con=DriverManager.getConnection (url,"hema","hema");
           out.println("Connected to DB");
           st = con.createStatement();
           int regno = Integer.parseInt(request.getParameter("regno"));
           String name = request.getParameter("name");
           String dob = request.getParameter("dob");
           float cgpa = Integer.parseInt(request.getParameter("cgpa"));
           String query = "insert into student values(?, ?, ?, ?)";
           pst = con.prepareStatement(query);
           pst.setInt(1, regno);
           pst.setString(2, name);
           pst.setString(3, dob);
           pst.setFloat(4, cgpa);
           pst.executeUpdate();

        }  catch (ClassNotFoundException err) {out.println (err) ;}
           catch (SQLException err) {out.println (err);  }
        out.println("</body>");
        out.println("</html>");
     }
   }

}
```

Program 3:

```
/* Delete from Student table using Servlet program */

import java.io.IOException;
import java.io.PrintWriter;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import java.sql.*;

public class DeletefromStudent extends HttpServlet {

   protected void processRequest(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, IOException {
      Connection con;
      String url = "jdbc:mysql://localhost:3306/vit";
      PreparedStatement pst;
      response.setContentType("text/html;charset=UTF-8");


      try (PrintWriter out = response.getWriter()) {
         /* TODO output your page here. You may use following sample code. */
         out.println("<!DOCTYPE html>");
         out.println("<html>");
         out.println("<head>");
         out.println("<title>Servlet Student</title>");
         out.println("</head>");
         out.println("<body>");
         out.println("<h1>Servlet Student at " + request.getContextPath() + "</h1>");

         try
         {
            Class.forName ("com.mysql.jdbc.Driver");
            out.println("Driver loaded");
            con=DriverManager.getConnection (url,"hema","hema");
            out.println("Connected to DB");
            st = con.createStatement();
            int regno = Integer.parseInt(request.getParameter("regno"));
            String query = "delete from student where regno=?";
            pst = con.prepareStatement(query);
            pst.setInt(1, regno);
            pst.executeUpdate();
```

```
        }   catch (ClassNotFoundException err) {out.println (err) ;}
            catch (SQLException err) {out.println (err);  }
        out.println("</body>");
        out.println("</html>");
    }
  }
```

```
/* Update Student table using Servlet program */

import java.io.IOException;
import java.io.PrintWriter;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import java.sql.*;

public class DeletefromStudent extends HttpServlet {

   protected void processRequest(HttpServletRequest request, HttpServletResponse
response)
        throws ServletException, IOException {
      Connection con;
      String url = "jdbc:mysql://localhost:3306/vit";
      PreparedStatement pst;
      response.setContentType("text/html;charset=UTF-8");


      try (PrintWriter out = response.getWriter()) {
         /* TODO output your page here. You may use following sample code. */
         out.println("<!DOCTYPE html>");
         out.println("<html>");
         out.println("<head>");
         out.println("<title>Servlet Student</title>");
         out.println("</head>");
         out.println("<body>");
         out.println("<h1>Servlet Student at " + request.getContextPath() +
"</h1>");

         try
         {
            Class.forName ("com.mysql.jdbc.Driver");
            out.println("Driver loaded");
            con=DriverManager.getConnection (url,"hema","hema");
```

```
            out.println("Connected to DB");
            st = con.createStatement();
            int regno = Integer.parseInt(request.getParameter("regno"));
            float cgpa = Float.parseFloat(request.getParameter("cgpa"));
            String query = "update student set cgpa=? where regno=?";
            pst = con.prepareStatement(query);
            pst.setInt(2, regno);
            pst.setFloat(1, cgpa);
            pst.executeUpdate();

         }  catch (ClassNotFoundException err) {out.println (err) ;}
            catch (SQLException err) {out.println (err);  }
         out.println("</body>");
         out.println("</html>");
      }
   }

}
```

PHP Programs

Student.html

```
<!DOCTYPE HTML>
<html>
<head>
</head>
<body>

<h2>PHP Form Validation Example</h2>
<form method="post" action="ActionsWithFORM.php">
  Reg. No: <input type="text" name="regno">
  <br><br>
  Name: <input type="text" name="name">
  <br><br>
  DOB: <input type="text" name="dob">
  <br><br>
  CGPA: <input type = "text" name="cgpa">
  <br><br>
  <input type="submit" name="submit" value="Submit">
</form>

</body>
</html>
```

ActionswithFORM – AddtoDB.php

```
<?php
$username = "hema";
$password = "hema";
$hostname = "localhost";

//connection to the database
$dbhandle = mysql_connect($hostname, $username, $password)
  or die("Unable to connect to MySQL");
echo "Connected to MySQL<br>";

//select a database to work with
$selected = mysql_select_db("vit",$dbhandle)
  or die("Could not select vit");

  //execute the SQL query and return records

$regno = $_POST['regno'];
$name = $_POST['name'];
$dob = $_POST['dob'];
$cgpa = $_POST['cgpa'];
$insert_query = "insert into student values ($regno, $name, $dob, $cgpa)";
$executed = mysql_query($insert_query, $dbhandle);

        if (!$executed)
                die("unable to insert values");
        else
                echo "inserted<br>";
//close the connection
mysql_close($dbhandle);
?>
```

ActionswithFORM – DeleteFromDB.php

```
<?php
$username = "hema";
$password = "hema";
$hostname = "localhost";

//connection to the database
$dbhandle = mysql_connect($hostname, $username, $password)
  or die("Unable to connect to MySQL");
echo "Connected to MySQL<br>";
```

```
//select a database to work with
$selected = mysql_select_db("vit",$dbhandle)
  or die("Could not select vit");

  //execute the SQL query and return records

$regno = $_POST['regno'];
$delete_query = "delete from student where regno = $regno";
$executed = mysql_query($delete_query, $dbhandle);

        if (!$executed)
                die("unable to insert values");
        else
                echo "inserted<br>";
//close the connection
mysql_close($dbhandle);
?>
```

ActionswithFORM – UpdateDB.php

```
<?php
$username = "hema";
$password = "hema";
$hostname = "localhost";

//connection to the database
$dbhandle = mysql_connect($hostname, $username, $password)
  or die("Unable to connect to MySQL");
echo "Connected to MySQL<br>";

//select a database to work with
$selected = mysql_select_db("vit",$dbhandle)
  or die("Could not select vit");

$regno = $_POST['regno'];
$cgpa  = $_POST['cgpa'];
$update_query = "update student set cgpa = $cgpa where regno = $regno";
$executed = mysql_query($update_query, $dbhandle);

        if (!$executed)
                die("unable to update values");
        else
                echo "updated...<br>";
//close the connection
mysql_close($dbhandle);
```

```
?>
```

Retrieving rows from database and display in table format

```
<?php
$username = "hema";
$password = "hema";
$hostname = "localhost";

//connection to the database
$dbhandle = mysql_connect($hostname, $username, $password)
  or die("Unable to connect to MySQL");
echo "Connected to MySQL<br>";

//select a database to work with
$selected = mysql_select_db("vit",$dbhandle)
  or die("Could not select examples");

  //execute the SQL query and return records
$result = mysql_query("SELECT regno, name, dob, cgpa FROM student");
//fetch tha data from the database

echo "<table >
  <tr>
    <th>Register Number </th>
    <th>Name</th>
    <th>DOB</th>
    <th>CGPA</td>
  </tr>";

  while($row = mysql_fetch_array($result))
  {
  echo "<tr>";
  echo "<td>".$row['regno']."</td>";
  echo "<td>".$row['name']."</td>";
  echo "<td>".$row['dob']."</td>";
  echo "<td>".$row['cgpa']."</td>";
  echo "</tr>";

  }
  echo "</table>";
/*while ($row = mysql_fetch_array($result)) {
   echo "Reg. No: ".$row{'regno'}." Name: ".$row{'name'}."DOB:
".$row{'dob'}."CGPA: ".$row{'cgpa'}."<br>";
}*/
```

```
//close the connection
mysql_close($dbhandle);
?>
```

JavaScript Validation Example

//SampleForm.html

```
<html lang="en">
<head>
	<meta charset="utf8">
	<title>JavaScript Form Validation using a sample registration form</title>

	<link rel='stylesheet' href='SampleForm.css' type='text/css' />

	<script src="SampleForm.js">
	</script>
</head>

<body onload="document.registration.userid.focus();">
	<h1>Registration Form</h1>
	<p>Use tab keys to move from one input field to the next.</p>

<form name='registration' onSubmit="return formValidation();">
	<ul>
	<li><label for="userid">User id:</label> </li>
	<li><input type="text" name="userid" size="12" /> </li>
	<li><label for="passid">Password:</label></li>
	<li><input type="password" name="passid" size="12" /></li>
	<li><label for="username">Name:</label></li>
	<li><input type="text" name="username" size="50"/></li>
	<li><label for="address">Address:</label></li>
	<li><input type="text" name="address" size="50" /></li>
	<li><label for="country">Country:</label></li>
	<li><select name="country">
		<option selected="" value="Default">(Please select a country)</option>
		<option value="AF">Australia</option> <option value="AL">Canada</option>
		<option value="DZ">India</option> <option
```

```
value="AS">Russia</option>
                <option value="AD">USA</option> </select></li>
        <li><label for="zip">ZIP Code:</label></li>
        <li><input type="text" name="zip" /></li>
        <li><label for="email">Email:</label></li>
        <li><input type="text" name="emai" size="50" /></li>
        <li><label id="gender">Gender:</label></li>
        <li><input type="radio" name="gender" value="Male"
/><span>Male</span></li>
        <li><input type="radio" name="gender" value="Female"
/><span>Female</span></li>                <li><label>Language:</label></li>
        <li><input type="checkbox" name="en" value="en" checked
/><span>English</span></li>
        <li><input type="checkbox" name="nonen" value="noen" /><span>Non
English</span></li>
        <li><label for="desc">About:</label></li>
        <li><textarea name="desc" id="desc"></textarea></li>
        <li><input type="submit" name="submit" value="Submit" /></li>
        <li><input type="text" name="result" size="12" /> </li>
        </ul>
</form>
</body>
</html>
```

SampleForm.css

```
h1 { margin-left: 70px; }

form li { list-style: none; margin-bottom: 5px; }

form ul li label{ float: left; clear: left; width: 100px; textalign:
right; margin-right: 10px; fontfamily:Verdana, Arial, Helvetica, sans-serif;
fontsize:14px; }

form ul li input, select, span { float: left; marginbottom:10px; }

form textarea { float: left; width: 350px; height: 150px; }

[type="submit"] { clear: left; margin: 20px 0 0 230px; fontsize:18px }

p { margin-left: 70px; font-weight: bold; }
```

SampleForm.js

```
function formValidation()
{
	var uid = document.registration.userid;
	var passid = document.registration.passid;
	var uname = document.registration.username;
	var uadd = document.registration.address;
	var ucountry = document.registration.country;
	var uzip = document.registration.zip;
	var uemail = document.registration.email;
	var ugender = document.getElementsByName(“gender");
	var result = document.registration.result;


	if(userid_validation(uid,5,12))
	{
		if(passid_validation(passid,7,12))
		{
			if(allLetter(uname))
			{
				if(alphanumeric(uadd))
				{
					if(countryselect(ucountry))
					{
						if(allnumeric(uzip))
						{
							if(ValidateEmail(uemail))
							{
								if(validsex(ugender))
								{
									result.value="valid"
									return true;
								}
							}
						}
					}
				}
			}
		}
	}
	result.value="valid"
	return false;
}
```

```
function userid_validation(uid,mx,my)
{
	var uid_len = uid.value.length;
	if (uid_len == 0 || uid_len >= my || uid_len < mx)
	{
		alert("User Id should not be empty / length be between "+mx+" to "+my);
		uid.focus();
		return false;
	}
	return true;
}

function passid_validation(passid,mx,my)
{
	var passid_len = passid.value.length;
	if (passid_len == 0 ||passid_len >= my || passid_len < mx)
	{
		alert("Password should not be empty / length be between "+mx+" to "+my);
		passid.focus();
		return false;
	}
	return true;
}

function allLetter(uname)
{
	var letters = /^[A-Za z]+$/;
	if(uname.value.match(letters))
	{
		return true;
	}
	else
	{
		alert('Username must have alphabet characters only');
		uname.focus();
		return false;
	}
}

function alphanumeric(uadd)
{
	var letters = /^[0-9a-zA-Z]+$/;
	if(uadd.value.match(letters))
```

```
        {
                return true;
        }
        else
        {
                alert('User address must have alphanumeric characters only');
                uadd.focus();
                return false;
        }
}

function countryselect(ucountry)
{
        if(ucountry.value == "Default")
        {
                alert('Select your country from the list');
                ucountry.focus();
                return false;
        }
        else
        {
                return true;
        }
}

function allnumeric(uzip)
{
        var numbers = /^[0-9]+$/;
        if(uzip.value.match(numbers))
        {
                return true;
        }
        else
        {
                alert('ZIP code must have numeric characters only');
                uzip.focus();
                return false;
        }
}

function ValidateEmail(uemail)
{
        var mailformat = /^\w+([\.-]?\w+)*@\w+([\.-]?\w+)*(\.\w{2,3})+$/;
        if(uemail.value.match(mailformat))
        {
```

```
                return true;
        }
        else
        {
                alert("You have entered an invalid email address!");
                uemail.focus();
                return false;

        }
}
function validgender(ugender)
{
var isChecked = false;
for (var i = 0; i < ugender.length; i++) {
if (usex[i].checked) {
isChecked = true; // found one element checked
break;
}
} if(isChecked==false)
{
alert("Select male/female");
}return isChecked; }
```