Lab Sheet 1

a. What is a database?

A Database is an organized collection of structured information, or data, typically stored electronically in a computer system.

b. Give some real time examples of the existing databases used by different companies in Sri Lanka.

- SLIIT use student information system to store student data.
- State banks used online banking system database to store customer data.
- Air Lanka use Airline reservation system to store customer information and reservation information.

c. What is the uniqueness that we can find in a database?

- Database can store large amount of data
- It can create relationships among data
- Any data item can be identified uniquely using a primary key
- Foreign keys used to create relationships in between tables

d. When do we need a database?

- To work with large amount of data
- To work concurrently with data
- To secure the data

e. What is a Database Management System?

A Database Management System (DBMS) refers to the technology for creating and managing databases. DBMS is a software tool to organize (create, retrieve, update, and manage) data in a database.

f. What are the DBMS types available?

- SQL
- Oracle
- My SQL
- MS Access
- Mongo DB

g. Is implementing a database be a good solution for all the places that deal with data?

If a company use small amount of data that can handle manually, it is not needed to implement a database. If a company have large amount of data, then implementing a database is a good solution.

Tables of the DataBase

Student Table

	SID	Sname	Address	dob	NIC	CID
1	CN18384756	Kamal	No122, Rose street, matale	1994-05-02	946785467v	CSNE
2	CN19465738	Sampath	No173, New kandy Road, kaduwella	1996-11-20	968764567v	CSNE
3	CS18223645	kalani	No08 , Gamini Road, Anuradhapura	1996-10-11	968564857v	CS
4	CS18234867	Damith	No125 , 1st street, kurunegala	1996-02-15	968763456v	CS
5	DS18234876	Pubudu	No678 , 3rd new lane, Maharahgama	1994-11-08	948763759v	DS
6	DS18375688	Kamani	No10 , new street, jaffna	1994-03-05	948763456v	DS
7	IS18758649	Jayni	No111, Perera street, kurunegala	1998-09-07	982359856v	ISE
8	IS19234876	Dulina	No124 , 2nd street, colombo10	1998-12-08	983485764v	ISE
9	IT18234568	Ann	No12, Kings street, colombo	1996-11-11	961234587v	IT
10	IT19275687	Rayan	No14, flower street, colombo12	1994-01-10	945673456v	IT
11	SE19238567	Malith	No08, st.thomas street, Kandy	1992-12-20	922356785v	SE
12	SE20284567	Pooja	No15, lakshmi Road, jaffna	1996-08-07	965678645v	SE

Course Table

	CID	Cname	C_Description	C_fee
1	CS	Cyber Security	Information systems engineering specialty program...	174000
2	CSNE	Computer Systems And Network Engineering	The programme aims to provide students with the k...	155000
3	DS	Data Scinece	The meticulous curriculum focuses on the fundame...	170000
4	ISE	Information System Engineering	Information systems engineering specialty program...	145000
5	IT	Infromaton Technology	The programme is designed for technically focused ...	175000
6	SE	Software Engineering	Software engineering is the discipline of designing, ...	185000

Module Table

	Mcode	Mname	M_Description	NoOfCredits
1	IE2051	Information Systems Project	subject under ISE	4
2	IE3030	Wide area Networks	subject under CSNE	4
3	IE3051	E Business Strategy & Architecture and Design	subject under ISE	3
4	IE3070	Network Technology Project	subject under CSNE	4
5	IE3080	Network Security Engineering	subject under CSNE	4
6	IE3081	Enterprise Resource Planning	subject under ISE	4
7	IE3082	Cryptography	subject under CS	4
8	IE3102	Enterprise Standards for Information Security	subject under CS	4
9	IE4011	Business Process Managemet	subject under ISE	4
10	IE4040	Information Assurance and Auditing	subject under CSNE	4
11	IE4042	Secure Software Engineering	subject under CS	4
12	IE4052	Hardware Security	subject under CS	4
13	IT1010	Introduction to Programming	subject under IT	4
14	IT1050	Object Oriented Concepts	subject under IT	2
15	IT1100	Internet and Web Technologies	subject under IT	4
16	IT2050	Computer Networks	subject under IT	4
17	IT3011	Theory and Practices in Statistical Modelling	subject under DS	4
18	IT3051	Fundamentals of Data Mining	subject under DS	4
19	IT3071	Machine Learning and Optimization Methods	subject under DS	4
20	IT3100	Industry Placement	subject under SE	8
21	IT4011	Database Administration and Storage Systems	subject under DS	4
22	SE30...	Distributed Systems	subject under SE	4
23	SE30...	User Experience Engineering	subject under SE	3
24	SE40...	Secure Software Development	subject under SE	4

Offers Table

	CID	Mcode	Accadamic_year	Semester
1	CS	IE3082	Y3	1
2	CS	IE3102	Y3	2
3	CS	IE4042	Y4	1
4	CS	IE4052	Y4	1
5	CSNE	IE3030	Y3	1
6	CSNE	IE3070	Y3	1
7	CSNE	IE3080	Y3	2
8	CSNE	IE4040	Y4	1
9	DS	IT3011	Y3	1
10	DS	IT3051	Y3	2
11	DS	IT3071	Y3	2
12	DS	IT4011	Y4	1
13	ISE	IE2051	Y2	2
14	ISE	IE3051	Y3	1
15	ISE	IE3081	Y3	2
16	ISE	IE4011	Y4	1
17	IT	IT1010	Y1	2
18	IT	IT1050	Y1	2
19	IT	IT1100	Y1	2
20	IT	IT2050	Y2	1
21	SE	IT3100	Y3	2
22	SE	SE30...	Y3	2
23	SE	SE30...	Y3	2
24	SE	SE40...	Y4	1

Lab Sheet 2

Section 1

a. Find all information about the students.

```
SELECT *
FROM Student
```

b. Find the module name and the no of credits for a module.

```
SELECT Mname,NoOfCredits
FROM Module;
```

c. Find students whose name start with letter 'A'.

```
SELECT *
FROM Student
WHERE Sname LIKE 'a%';
```

d. Find the names of the students who were born before 1996/01/01.

```
SELECT Sname
FROM Student
WHERE dob< '1996-01-01';
```

e. Find name and NIC of students who are from 'Colombo' District.

```
SELECT Sname,NIC
FROM Student
WHERE Address LIKE '%colombo%';
```

f. Find the students whose names are starting from 'K' and following 'DS' course.

```
SELECT *
FROM Student
WHERE sname LIKE 'k%' AND CID = 'DS';
```

g. Select the students who are following either 'DS' or 'IT' courses.

```
SELECT *
FROM Student
WHERE CID = 'DS' OR CID = 'IT';
```

Section 2

a. Select all the students sorted by the sname column.

```
SELECT *
FROM Student
ORDER BY Sname;
```

b. Select all students from the "Student" table, sorted DESCENDING by the "NIC" column.

```
SELECT *
```

```
FROM Student
ORDER BY NIC DESC;
```

c. Select all students from the "Student" table, sorted ASCENDING by the "sname" column and descending by the "CID" column

```
SELECT *
FROM Student
ORDER BY Sname, CID DESC;
```

Lab Sheet 3

a. How many students are in the university?

```
SELECT COUNT(SID) As 'No of Students in the university'
FROM Student;
```

b. How many courses are offered by the university?

```
SELECT COUNT(CID) AS 'No of Courses'
FROM Course;
```

c. Display the above result with the title "Number of courses".

d. How many modules are there which have 03 credits only?

```
SELECT COUNT(Mcode) As '3 Credit Courses'
FROM Module
WHERE NoOfCredits = 3;
```

e. If one student wants to register all courses at ones, what is the total course fee that he/she wants to pay?

```
SELECT SUM(C_fee) As 'Sum of All Courses Fee'
FROM Course;
```

f. What is the highest course fee?

```
SELECT MAX(C_fee) As 'Highest Course Fee'
FROM Course;
```

g. What is the lowest course fee?

```
SELECT MIN(C_fee) As 'Lowest Course Fee'
FROM Course;
```

h. What is the Average courses fee of a course?

```
SELECT AVG(C_fee) As 'Average Course Fee'
FROM Course;
```

Lab Sheet 4

SELECT clause cannot have any column name that is not there in the GROUP BY clause.

GROUP BY clause can have columns that is not there is the SELECT clause.

a. Display the total number of modules in each course?

```
SELECT CID, COUNT(Mcode) As 'No of Modules'
FROM Offers
GROUP BY CID;
```

	CID	No of Modules
1	CS	4
2	CSNE	4
3	DS	4
4	ISE	4
5	IT	4
6	SE	4

b. How many students are there for each course? Re name the count as 'Number of Student'.

```
SELECT CID, COUNT(SID) As 'No Of Students'
FROM Student
GROUP BY CID;
```

	CID	No Of Students
1	CS	2
2	CSNE	2
3	DS	2
4	ISE	2
5	IT	2
6	SE	2

c. What is the number of Modules offered by each course in each academic year?

```
SELECT CID,Accadamic_year,COUNT(Mcode) As 'No of Modules'
FROM Offers
GROUP BY CID,Accadamic_year;
```

	CID	Accadamic_year	No of Modules
1	IT	Y1	3
2	ISE	Y2	1
3	IT	Y2	1
4	CS	Y3	2
5	CSNE	Y3	3
6	DS	Y3	3
7	ISE	Y3	2
8	SE	Y3	3
9	CS	Y4	2
10	CSNE	Y4	1
11	DS	Y4	1
12	ISE	Y4	1
13	SE	Y4	1

d. What is the number of Modules in Semester 02 only?

```
SELECT CID,Accadamic_year,COUNT(Mcode) As 'No Of Modules in Semester 2'
FROM Offers
WHERE Semester=2
GROUP BY CID,Accadamic_year;
```

	CID	Accadamic_year	No Of Modules in Semester 2
1	IT	Y1	3
2	ISE	Y2	1
3	CS	Y3	1
4	CSNE	Y3	1
5	DS	Y3	2
6	ISE	Y3	1
7	SE	Y3	3

e. Sort the results of Question (d.) according to the ascending order of CID

```
SELECT CID,Accadamic_year,COUNT(Mcode) As 'No Of Modules in Semester 2'
FROM Offers
WHERE Semester=2
GROUP BY CID,Accadamic_year
ORDER BY CID ASC;
```

	CID	Accadamic_year	No Of Modules in Semester 2
1	CS	Y3	1
2	CSNE	Y3	1
3	DS	Y3	2
4	ISE	Y2	1
5	ISE	Y3	1
6	IT	Y1	3
7	SE	Y3	3

Lab Sheet 5

We cannot use aggregate functions like COUNT(SID) with WHERE clause. For that You should use Having clause.

a) Display the number of students for each course? List the Course_ID of courses only if there are less than 10 students for the course.

```
SELECT CID, COUNT(SID) As 'No of Students'
FROM Student
GROUP BY CID
HAVING COUNT(SID) < 10;
```

	CID	No of Students
1	CS	2
2	CSNE	2
3	DS	2
4	ISE	2
5	IT	2
6	SE	2

b) List the Course_ID and the number of modules offered for each course. Display only the course ids which have more than 3 modules offered in it. Sort the result according to the ascending order of the module count.

```
SELECT CID, COUNT(Mcode) As 'No of Modules'
FROM Offers
GROUP BY CID
HAVING COUNT(Mcode) > 3
ORDER BY COUNT(Mcode) ASC;
```

	CID	No of Modules
1	CS	4
2	CSNE	4
3	DS	4
4	ISE	4
5	IT	4
6	SE	4

c) Display the course id, academic year and the number of modules offered. The number of modules offered should be less than 10.

```
SELECT CID,Accadamic_year,COUNT(Mcode) As 'No of Modules'
FROM Offers
GROUP BY CID,Accadamic_year
```

```
HAVING COUNT(Mcode) < 10;
```

	CID	Accadamic_year	No of Modules
1	IT	Y1	3
2	ISE	Y2	1
3	IT	Y2	1
4	CS	Y3	2
5	CSNE	Y3	3
6	DS	Y3	3
7	ISE	Y3	2

d) List the courses that offer more than 2 modules for year 3 students?

```
SELECT CID, COUNT(Mcode) As 'No of Modules'
FROM Offers
WHERE Accadamic_year = 'Y3'
GROUP BY CID
HAVING  COUNT(Mcode) > 2
```

	CID	No of Modules
1	CSNE	3
2	DS	3
3	SE	3

Lab Sheet 6

a) Make a list of the student ID, name and the name of the course the student is following.

```
SELECT S.SID,S.Sname,C.Cname
FROM Student S, Course C
WHERE S.CID = C.CID;
```

b) Make a list of the CIDs and the names of the modules offered by those courses.

```
SELECT Cname,Mname
FROM Course C,Module M,Offers O
WHERE C.CID = O.CID AND M.Mcode = O.Mcode;
```

c) Make a list of course names and the names of modules offered.

```
 SELECT Cname,Mname
FROM Course C,Module M,Offers O
WHERE C.CID = O.CID AND M.Mcode = O.Mcode;
```

d) What are the ID and names of the students who have registered for the course by paying a registration fee of more than 1 Lak?

```
SELECT S.SID,S.Sname
FROM Student S, Course C
WHERE S.CID = C.CID AND C.C_fee > 100000;
```

e) What are the names of modules offered to year I students by the Information Technology Course?

```
SELECT M.Mname,O.Accadamic_year,O.CID
FROM Module M, Offers O
WHERE M.Mcode = O.Mcode AND Accadamic_year = 'Y1' AND CID = 'IT';
```

Lab Sheet 7

a) How many Students are there in each course? List the CID and the number of students.

```
-----We can retrieve same data without table joining as well----
SELECT C.CID, COUNT(SID) As 'No of Students'
FROM Student S,Course C
WHERE S.CID = C.CID
GROUP BY C.CID;
```

b) How many Students are there in each course? List the course name and the number of Students.

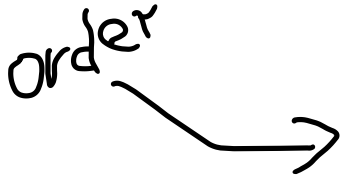
```
SELECT C.Cname, COUNT(SID) As 'No of Students'
FROM Student S,Course C
WHERE S.CID = C.CID
GROUP BY C.Cname;
```

c) What are the courses which offer more than 2 modules for year 1 students?

```
SELECT c.Cname
FROM Course c, Offers o
WHERE c.CID = o.CID AND o.Accadamic_year = 'Y1'
GROUP BY c.Cname
HAVING COUNT(o.Mcode) > 2;
```

d) What are the courses which offer more than 2 modules for any academic year? List the course names, academic year and the no of modules offered. Sort the result according to the no of modules.

```
SELECT  c.Cname,o.Accadamic_year,COUNT(o.Mcode) As 'No of Modules'
FROM Course c,Offers o
WHERE c.CID = o.CID
GROUP BY c.Cname,o.Accadamic_year
HAVING COUNT(o.Mcode) > 2
ORDER BY COUNT(o.Mcode) ASC;
```



SELECT
FROM
WHERE
GROUP BY
HAVING
ORDER BY