



**KENDRIYA VIDYALAYA SANGATHAN  
ERNAKULAM REGION**

**केन्द्रीय विद्यालय संगठन  
क्षेत्रीय कार्यालय - एर्नाकुलम  
STUDENT SUPPORT MATERIAL**

**2021-2022**

**TERM 2**

**INFORMATICS PRACTICES (065)**

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**KENDRIYA VIDYALAYA SANGATHAN, ERNAKULAM REGION**

**केन्द्रीय विद्यालय संगठन, एर्नाकुलम क्षेत्र**

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**MESSAGE FROM HONOURABLE DEPUTY COMMISSIONER  
KVS REGIONAL OFFICE ERNAKULAM**



**Mr R Senthil Kumar**  
Deputy Commissioner  
KVSRO Ernakulam

**MESSAGE**

*I feel immense pleasure to publish the study material for class XJJ Informatics Practices (065). This support material is prepared incorporating all the recent changes in curriculum and assessment process made by C.B.S.E. I am sure it will definitely be of great help to class XJJ students of all Kendriya Vidyalayas.*

*Getting acquainted with the latest changes will help students to prepare well for the board examination and enable students to face case based and Multiple-Choice Questions with confidence. This support material has been prepared by a team of dedicated and veteran teachers with expertise in their respective subjects. The Support material contains all the important aspects required by the students- the design of question paper, term wise split up syllabus, summary of all the chapters, important formulas, Sample question papers, problem solving and Case study questions. I hope that this Support Material will be used by students and teachers as well and will prove to be a good tool for quick revision.*

*I would like to express my sincere gratitude to the In-charge principal and all the teachers who have relentlessly worked for the preparation of this study material. Their enormous contribution in making this project successful is praiseworthy. Meticulous planning blended with hard work, effective time management and sincerity will help the students to reach the pinnacle of success.*

*Wish you all the best*

  
( R Senthil Kumar )

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## TERM 2 - SYLLABUS

Sl.No	UNIT	MARKS
1	Unit 2: Database Query using SQL	25
2	Unit 3: Introduction to Computer Networks	10

### Unit 2:

#### Database Query using SQL

- Math functions: POWER (), ROUND (), MOD ().
- Text functions: UCASE ()/UPPER (), LCASE ()/LOWER (), MID ()/SUBSTRING ()/SUBSTR (), LENGTH (), LEFT (), RIGHT (), INSTR (), LTRIM (), RTRIM (), TRIM ().
- Date Functions: NOW (), DATE (), MONTH (), MONTHNAME (), YEAR (), DAY (), DAYNAME ().
- Aggregate Functions: MAX (), MIN (), AVG (), SUM (), COUNT (); using COUNT (\*).
- Querying and manipulating data using Group by, Having, Order by.

### Unit 3: Introduction to Computer Networks

- Introduction to networks, Types of network: LAN, MAN, WAN.
- Network Devices: modem, hub, switch, repeater, router, gateway.
- Network Topologies: Star, Bus, Tree, Mesh.
- Introduction to Internet, URL, WWW and its applications- Web, email, Chat, VoIP. Website: Introduction, difference between a website and webpage, static vs dynamic web page, web server and hosting of a website.
- Web Browsers: Introduction, commonly used browsers, browser settings, add-ons and plug-ins, cookies.

## Distribution of Practical Marks

Topic	Marks
SQL queries (pen and paper)	7
Practical File – 12 SQL Queries	2
Final Project Submission	3
Viva	3
Total	15

### Suggested Practical List :

#### Data Management

1. Create a student table with the student id, name, and marks as attributes where the student id is the primary key.
2. Insert the details of a new student in the above table.
3. Delete the details of a student in the above table.
4. Use the select command to get the details of the students with marks more than 80.
5. Find the min, max, sum, and average of the marks in a student marks table.
6. Find the total number of customers from each country in the table (customer ID, customer Name, country) using group by.
7. Write a SQL query to order the (student ID, marks) table in descending order of the marks.

#### Project Work

**The aim of the class project is to create tangible and useful IT applications. The learner may identify a real-world problem by exploring the environment. e.g. Students can visit shops/business places, communities or other organizations in their localities and enquire about the functioning of the organization, and how data are generated, stored, and managed.**

The learner can take data stored in csv or database file and analyze using Python libraries and generate appropriate charts to visualize. If an organization is maintaining data offline, then the learner should create a database using MySQL and store the data in tables.

Data can be imported in Pandas for analysis and visualization. Learners can use Python libraries of their choice to develop software for their school or any other social good. Learners should be sensitized to avoid plagiarism and violation of copyright issues while working on projects. Teachers should take necessary measures for this. Any resources (data, image etc.) used in the project must be suitably referenced.

The project can be done individually or in groups of 2 to 3 students. The project should be started by students at least 6 months before the submission deadline.



Unit 2  
Database Query And SQL

SQL Math Functions:

- **POW( ) or POWER( )**

*POWER( A, B) or POW( A, B) returns the number A raised to the power of another number B.*

*Here the number A is the base and the number B is the exponent.*

*Needs 2 numbers as parameters.*

**SYNTAX: SELECT POW( A, B);**

*Examples:*

1) `mysql> select power(2,3);`

```
+-----+
| power(2,3) |
+-----+
|      8      |
+-----+
```

*1 row in set (0.05 sec)*

2) `mysql>select pow(2,3);`

```
+-----+
| pow(2,3) |
+-----+
|      8      |
+-----+
```

*1 row in set (0.00 sec)*

3) `mysql>select pow(2.0 , 3.0);`

```
+-----+
| pow(2.0,3.0) |
+-----+
|      8      |
+-----+
```

*1 row in set (0.00 sec)*

- **ROUND( )**

*This function is used to round the number to the specified number of decimal places.*

*Parameters required: the number to be rounded and the number of decimal places required.*

*If the number of decimal places required is not mentioned, then the result will not have decimal places.*

**Syntax: SELECT ROUND(NUMBER, NUMBER OF DECIMAL PLACES)**

*Examples:*

1) `mysql>select round(2.25);`

```
+-----+  
| round(2.25) |  
+-----+  
|      2      |  
+-----+
```

1 row in set (0.01 sec)

2) `mysql>select round(2.25, 1);`

```
+-----+  
| round(2.25, 1) |  
+-----+  
|      2.3      |  
+-----+
```

1 row in set (0.00 sec)

3) `mysql>select round(2.25, 2);`

```
+-----+  
| round(2.25, 2) |  
+-----+  
|      2.25     |  
+-----+
```

1 row in set (0.00 sec)

4) `mysql>select round(2.26, 0);`

```
+-----+  
| round(2.26, 0) |  
+-----+  
|      2         |  
+-----+
```

1 row in set (0.00 sec)

5) `mysql>select round(135.43, 0);`

```
+-----+  
| round(135.43, 0) |  
+-----+  
|      135         |  
+-----+
```

1 row in set (0.00 sec)

6) `mysql>select round(135.53, 0);`

```
+-----+
```

```
| round(135.53, 0) |
```

```
+-----+
```

```
|      136      |
```

```
+-----+
```

```
1 row in set (0.00 sec)
```

7) `mysql>select round(135.55, 1);`

```
+-----+
```

```
| round(135.55, 1) |
```

```
+-----+
```

```
|     135.6     |
```

```
+-----+
```

```
1 row in set (0.00 sec)
```

8) `mysql>select round(135.55, -1);`

```
+-----+
```

```
| round(135.55, -1) |
```

```
+-----+
```

```
|      140      |
```

```
+-----+
```

```
1 row in set (0.00 sec)
```

9) `mysql>select round(134.45, -1);`

```
+-----+
```

```
| round(134.45, -1) |
```

```
+-----+
```

```
|      130      |
```

```
+-----+
```

```
1 row in set (0.00 sec)
```

10) `mysql>select round(134.45, -2);`

```
+-----+
```

```
| round(134.45, -2) |
```

```
+-----+
```

```
|      100      |
```

```
+-----+
```

```
1 row in set (0.00 sec)
```

```
11) mysql>select round(154.45, -2);
```

```
+-----+  
| round(154.45, -2) |  
+-----+  
|          200      |  
+-----+  
1 row in set (0.00 sec)
```

```
12) mysql>select round(1454.45, -2);
```

```
+-----+  
| round(1454.45, -2) |  
+-----+  
|          1500      |  
+-----+  
1 row in set (0.00 sec)
```

```
13) mysql>select round(1444.45, -2);
```

```
+-----+  
| round(1444.45, -2) |  
+-----+  
|          1400      |  
+-----+  
1 row in set (0.00 sec)
```

```
14) mysql>select round(1444.45, -3);
```

```
+-----+  
| round(1444.45, -3) |  
+-----+  
|           1000      |  
+-----+  
1 row in set (0.00 sec)
```

```
15) mysql>select round(1544.45, -3);
```

```
+-----+  
| round(1544.45, -3) |  
+-----+  
|           2000      |  
+-----+  
1 row in set (0.00 sec)
```

- MOD( )

*This function can be used to find modulus (remainder) when one number is divided by another.*

*Examples:*

1) `mysql>select mod(5,3);`

```
+-----+
| mod(5,3) |
+-----+
|    2    |
+-----+
1 row in set (0.00 sec)
```

2) `mysql> select mod(5,4);`

```
+-----+
| mod(5,4) |
+-----+
|    1    |
+-----+
1 row in set (0.00 sec)
```

3) `mysql>select mod(4,2);`

```
+-----+
| mod(4,2) |
+-----+
|    0    |
+-----+
1 row in set (0.00 sec)
```

### **Text/String/Character Functions:**

- UCASE( ) / UPPER( )

**Used to convert a character or text to uppercase.**

**Examples:**

1) `mysql>SELECT UCASE('hello');`

```
+-----+
| UCASE('hello') |
+-----+
| HELLO          |
+-----+
1 row in set (0.00 sec)
```

```
2) mysql>SELECT Upper('hello');
```

```
+-----+
```

```
| Upper('hello') |
```

```
+-----+
```

```
| HELLO          |
```

```
+-----+
```

```
1 row in set (0.00 sec)
```

- **LCASE( ) / LOWER( )** : *To convert a character or text to lowercase.*

**Examples:**

```
1) mysql>select lcase('HELLO');
```

```
+-----+
```

```
| lcase('HELLO') |
```

```
+-----+
```

```
| hello          |
```

```
+-----+
```

```
1 row in set (0.00 sec)
```

```
2) mysql>select LOWER('HELLO');
```

```
+-----+
```

```
| LOWER('HELLO') |
```

```
+-----+
```

```
| hello          |
```

```
+-----+
```

```
1 row in set (0.00 sec)
```

- **MID( )** : *To extract a specified number of characters from the string.*

*First parameter is the text/string. Second parameter is the starting index and the third parameter is the number of characters required.*

*(Note: index starts with 1 and not 0.)*

**Examples:**

```
1) mysql>SELECT MID('ABCDEFGHJKLMNOP', 1,4);
```

```
+-----+
```

```
| MID('ABCDEFGHJKLMNOP', 1,4) |
```

```
+-----+
```

```
| ABCD           |
```

```
+-----+
```

```
1 row in set (0.00 sec)
```

2) mysql>SELECT MID('ABCDEFGHJKLMNOP', 1);

```
+-----+
| MID('ABCDEFGHJKLMNOP', 1) |
+-----+
| ABCDEFGHJKLMNOP          |
+-----+
```

1 row in set (0.00 sec)

3) mysql> SELECT MID('ABCDEFGHJKLMNOP', -2,-1);

```
+-----+
| MID('ABCDEFGHJKLMNOP', -2,-1) |
+-----+
|                                |
+-----+
```

1 row in set (0.00 sec)

4) mysql>SELECT MID('ABCDEFGHJKLMNOP', 0,4);

```
+-----+
| MID('ABCDEFGHJKLMNOP', 0,4) |
+-----+
|                                |
+-----+
```

1 row in set (0.00 sec)

***(Please note the output of example 3, 4)***

5) mysql>SELECT MID('ABCDEFGHJKLMNOP', 3,4);

```
+-----+
| MID('ABCDEFGHJKLMNOP', 3,4) |
+-----+
| CDEF                          |
+-----+
```

1 row in set (0.00 sec)

6) mysql>SELECT MID('ABCDEFGHJKLMNOP', -4,2);

```
+-----+
| MID('ABCDEFGHJKLMNOP', -4,2) |
+-----+
| MN                            |
+-----+
```

1 row in set (0.00 sec)

- **SUBSTRING( )** : Same as that of MID( ). To extract a specified number of characters from the string.

**Examples:**

1) mysql>SELECT SUBSTRING('ABCDEFGHIJKLMNOP', 3,4);

```
+-----+
| SUBSTRING('ABCDEFGHIJKLMNOP', 3,4) |
+-----+
| CDEF                               |
+-----+
```

1 row in set (0.00 sec)

2) mysql>SELECT SUBSTRING('ABCDEFGHIJKLMNOP', 0,4);

```
+-----+
| SUBSTRING('ABCDEFGHIJKLMNOP', 0,4) |
+-----+
|                                     |
+-----+
```

1 row in set (0.00 sec)

3) mysql>SELECT SUBSTRING('ABCDEFGHIJKLMNOP', 1,4);

```
+-----+
| SUBSTRING('ABCDEFGHIJKLMNOP', 1,4) |
+-----+
| ABCD                               |
+-----+
```

1 row in set (0.00 sec)

4) mysql>SELECT SUBSTRING('ABCDEFGHIJKLMNOP', 4,2);

```
+-----+
| SUBSTRING('ABCDEFGHIJKLMNOP', 4,2) |
+-----+
| DE                                   |
+-----+
```

1 row in set (0.00 sec)



5) mysql>SELECT SUBSTRING('ABCDEFGHJKLMNOP', -4,2);

```
+-----+
| SUBSTRING('ABCDEFGHJKLMNOP', -4,2) |
+-----+
| MN                                |
+-----+
```

1 row in set (0.00 sec)

- **SUBSTR( )** : Same as that of MID( ) and SUBSTRING( )

Examples:

1) mysql>SELECT SUBSTR('ABCDEFGHJKLMNOP', -4,3);

```
+-----+
| SUBSTR('ABCDEFGHJKLMNOP', -4,3) |
+-----+
| MNO                              |
+-----+
```

1 row in set (0.00 sec)

2) mysql>SELECT SUBSTR('ABCDEFGHJKLMNOP', 1,3);

```
+-----+
| SUBSTR('ABCDEFGHJKLMNOP', 1,3) |
+-----+
| ABC                              |
+-----+
```

1 row in set (0.00 sec)

3) mysql>SELECT SUBSTR('ABCDEFGHJKLMNOP', 4,3);

```
+-----+
| SUBSTR('ABCDEFGHJKLMNOP', 4,3) |
+-----+
| DEF                              |
+-----+
```

1 row in set (0.00 sec)

- **LENGTH() :** *This function returns the number of characters in the given text.*

**Examples:**

1) mysql> SELECT LENGTH('HELLO WORLD');

```
+-----+
| LENGTH('HELLO WORLD') |
+-----+
|          11          |
+-----+
```

1 row in set (0.00 sec)

2) mysql> SELECT LENGTH(' ');

```
+-----+
| LENGTH(' ') |
+-----+
|          3   |
+-----+
```

1 row in set (0.00 sec)

3) mysql> SELECT LENGTH(' ');

```
+-----+
| LENGTH(' ') |
+-----+
|          1   |
+-----+
```

1 row in set (0.00 sec)

- **LEFT() :** *Returns the specified number of characters including space starting from the left most characters.*

Parameters required : text, number of characters to be extracted.

**Examples:**

1) mysql>SELECT LEFT('ABCDEFGHIJKLMNPO',1);

```
+-----+
| LEFT('ABCDEFGHIJKLMNPO',1) |
+-----+
| A                            |
+-----+
```

1 row in set (0.00 sec)

```
2) mysql> SELECT LEFT('ABCDEFGHIJKLMNPO',2);
```

```
+-----+
| LEFT('ABCDEFGHIJKLMNPO',2) |
+-----+
| AB                          |
+-----+
```

1 row in set (0.00 sec)

```
3) mysql> SELECT LEFT('ABCDEFGHIJKLMNPO',3);
```

```
+-----+
| LEFT('ABCDEFGHIJKLMNPO',3) |
+-----+
| ABC                        |
+-----+
```

1 row in set (0.00 sec)

```
4) mysql> SELECT LEFT('ABCDEFGHIJKLMNPO',-1);
```

```
+-----+
| LEFT('ABCDEFGHIJKLMNPO',-1) |
+-----+
|                               |
+-----+
```

1 row in set (0.00 sec)

(Note : in the above example , the number of characters to be selected is -1 and hence characters are not extracted)

- **RIGHT( )** :Returns the specified number of characters including space starting from the right of the text.

Parameters required : text, number of characters to be extracted.

**Examples:**

```
1) mysql> SELECT RIGHT('ABCDEFGHIJKLMNPO',1);
```

```
+-----+
| RIGHT('ABCDEFGHIJKLMNPO',1) |
+-----+
| P                            |
+-----+
```

1 row in set (0.00 sec)

( Extracting 1 character )

2) mysql> SELECT RIGHT('ABCDEFGHJKLMNOP',2);

```
+-----+
| RIGHT('ABCDEFGHJKLMNOP',2) |
+-----+
| OP                          |
+-----+
```

1 row in set (0.00 sec)

*(extracting 2 characters)*

3) mysql> SELECT RIGHT('ABCDEFGHJKLMNOP',3);

```
+-----+
| RIGHT('ABCDEFGHJKLMNOP',3) |
+-----+
| NOP                          |
+-----+
```

1 row in set (0.00 sec)

4) mysql> SELECT RIGHT('ABCDEFGHJKLMNOP',4);

```
+-----+
| RIGHT('ABCDEFGHJKLMNOP',4) |
+-----+
| MNOP                          |
+-----+
```

1 row in set (0.00 sec)

5) mysql> SELECT RIGHT('ABCDEFGHJKLMNOP',-1);

```
+-----+
| RIGHT('ABCDEFGHJKLMNOP',-1) |
+-----+
|                               |
+-----+
```

1 row in set (0.00 sec)

- **INSTR( )** : Checks whether the second string/text is present in the first string. If present it returns the starting index. Otherwise returns 0.

**Examples:**

1) mysql> SELECT INSTR('ABCDEFGHJKLMNOP','ABC');

```
+-----+
| INSTR('ABCDEFGHJKLMNOP','ABC') |
+-----+
| 1                               |
+-----+
```

1 row in set (0.00 sec)

2) mysql> SELECT INSTR('ABCDEFGHJKLMNOP','BC');

```
+-----+
| INSTR('ABCDEFGHJKLMNOP','BC') |
+-----+
|                2                |
+-----+
```

1 row in set (0.00 sec)

3) mysql> SELECT INSTR('ABCDEFGHJKLMNOP','P');

```
+-----+
| INSTR('ABCDEFGHJKLMNOP','P') |
+-----+
|                16                |
+-----+
```

1 row in set (0.00 sec)

4) mysql> SELECT INSTR('ABCDEFGHJKLMNOP','EFG');

```
+-----+
| INSTR('ABCDEFGHJKLMNOP','EFG') |
+-----+
|                5                |
+-----+
```

1 row in set (0.00 sec)

5) mysql> SELECT INSTR('ABCDEFGHJKLMNOP','QRST');

```
+-----+
| INSTR('ABCDEFGHJKLMNOP','QRST') |
+-----+
|                0                |
+-----+
```

1 row in set (0.00 sec)

- **LTRIM( )** : *To trim the spaces, if any, from the beginning of the text.*

**Examples:**

- 1) `mysql> SELECT LTRIM(' HELLO');`

```
+-----+
| LTRIM(' HELLO') |
+-----+
| HELLO           |
+-----+
```

1 row in set (0.00 sec)

- **RTRIM( )** : *To trim the spaces, if any, from the end of the text.*

**Examples:**

- 1) `mysql> SELECT RTRIM('HELLO ');`

```
+-----+
| RTRIM('HELLO ') |
+-----+
| HELLO           |
+-----+
```

1 row in set (0.00 sec)

- 2) `mysql> SELECT CONCAT(RTRIM('HELLO '), 'WORLD');`

```
+-----+
| CONCAT(RTRIM('HELLO '), 'WORLD') |
+-----+
| HELLOWORLD                       |
+-----+
```

1 row in set (0.00 sec)

- **TRIM( )** : *To trim the spaces, if any, from the beginning and end of the text.*

**Examples:**

- 1) `mysql> SELECT CONCAT(TRIM('HELLO '), 'WORLD');`

```
+-----+
| CONCAT(TRIM('HELLO '), 'WORLD') |
+-----+
| HELLOWORLD                       |
+-----+
```

1 row in set (0.00 sec)

*Note: CONCAT( ) combines two strings/texts*

```
2) mysql> SELECT TRIM(' HELLO ');
```

```
+-----+  
| TRIM(' HELLO ') |  
+-----+  
| HELLO           |  
+-----+
```

1 row in set (0.00 sec)

**Try yourself:**

*Give the output of the following:*

1. `SELECT POWER(3,3);`
2. `SELECT POW(3,2);`
3. `SELECT ROUND(123.45,1);`
4. `SELECT ROUND(123.45,-1);`
5. `SELECT ROUND(123.45,0);`
6. `SELECT ROUND(153.45,2);`
7. `SELECT ROUND(155.45,0);`
8. `SELECT ROUND(245,-2);`
9. `SELECT ROUND(255,-2);`
10. `SELECT ROUND(897, -3);`
11. `SELECT ROUND(457, -3);`
12. `SELECT ROUND(1567, -3);`
13. `SELECT RIGHT('MORNING', 2);`
14. `SELECT MID( TRIM(' GOOD '), 1, 4);`
15. `SELECT INSTR( 'GOOD MORNING', 'GOOD' );`

*Answers:*

1) 27, 2)9, 3)123.5 4)120, 5)123 6)200, 7)155, 8)200, 9)300, 10)1000, 11)0, 12)2000,  
13)NG , 14)GOOD, 15)1

### **DATE AND TIME FUNCTIONS:**

<i>Function</i>	<i>Description</i>	<i>Example</i>
<i>CURDATE()/ CURRENT_DATE()/ CURRENT_DATE</i>	<i>Return the current date</i>	<i>Select curdate(); Select current_date();</i>
<i>DATE()</i>	<i>Return date part from date- time expression</i>	<i>Select date('2018-08-15 12:30'); Output: 2018-08-15</i>
<i>MONTH()</i>	<i>Return month from date</i>	<i>Select month('2018-08-15'); Output: 08</i>
<i>YEAR()</i>	<i>Return year from date</i>	<i>Select year('2018-08-15'); Output: 2018</i>
<i>DAYNAME()</i>	<i>Return weekday name</i>	<i>Select dayname('2018-12-04'); Output: Tuesday</i>
<i>DAYOFMONTH()</i>	<i>Return value from 1-31</i>	<i>Select dayofmonth('2018-08-15') Output: 15</i>
<i>DAYOFWEEK()</i>	<i>Return weekday index, for Sunday-1, Monday-2, ..</i>	<i>Select dayofweek('2018-12-04'); Output: 3</i>
<i>DAYOFYEAR()</i>	<i>Return value from 1-366</i>	<i>Select dayofyear('2018-02-10') Output: 41</i>
<i>NOW()</i>	<i>Return both current date and time at which the function executes</i>	<i>Select now();</i>
<i>SYSDATE()</i>	<i>Return both current date and time</i>	<i>Select sysdate();</i>

#### **Difference Between NOW() and SYSDATE() :**

*NOW()* function return the date and time at which function was executed even if we execute multiple *NOW()* function with select. whereas *SYSDATE()* will always return date and time at which each *SYSDATE()* function started execution.

*For example.*

```
mysql> Select now(), sleep(2), now();
```

```
Output: 2018-12-04 10:26:20, 0, 2018-12-04 10:26:20
```

```
mysql> Select sysdate(), sleep(2), sysdate();
```

```
Output: 2018-12-04 10:27:08, 0, 2018-12-04 10:27:10
```



### **AGGREGATE functions:**

Aggregate function is used to perform calculation on group of rows and return the calculated summary like sum of salary, average of salary etc.

Available aggregate functions are –

1. SUM ()
2. AVG ()
3. COUNT ()
4. MAX ()
5. MIN ()
6. COUNT (\*)

**Consider the following table:**

Empno	Name	Dept	Salary
1	Ravi	Sales	24000
2	Sunny	Sales	35000
3	Shobit	IT	30000
4	Vikram	IT	27000
5	nitin	HR	45000

*mysql>Select SUM (salary) from emp;*

**Output – 161000**

*mysql>Select SUM (salary) from emp where dept = 'sales';*

**Output - 59000**

*mysql>Select AVG (salary) from emp;*

**Output – 32200**

*mysql>Select AVG (salary) from emp where dept = 'sales';*

**Output - 29500**

*mysql>Select MAX(Salary) from emp;*

**Output – 45000**

*mysql>Select MAX (salary) from emp where dept = 'Sales';*

**Output - 35000**

*mysql>Select MIN(Salary) from emp;*

**Output – 24000**

*mysql>Select MIN (salary) from emp where dept = 'IT';*

**Output - 27000**

*mysql>Select COUNT(\*) from emp;*

**Output – 6**

mysql>Select COUNT(salary) from emp;

Output - 5

**count (\*) Vs count ()**

count (\*) function is used to count the number of rows in query output whereas count () is used to count values present in any column excluding NULL values.

**Note:**

**All aggregate function ignores the NULL values.**

**MULTIPLE CHOICE QUESTIONS:**

- 1.All aggregate functions ignore NULLs except for the \_\_\_\_\_ function.  
(a) Distinct (b) Count(\*) (c) Average() (d) None of these
2. Which of the following are correct aggregate functions in SQL.  
(a) AVERAGE() (b) MAX() (c) COUNT() (d) TOTAL()

**FILL IN THE BLANKS**

- 1.Aggregate Functions cannot be used in \_\_\_\_\_ clause of the Select query.
2. The SQL built-in function \_\_\_\_ obtains the total values in numeric columns.
3. The SQL built-in function \_\_\_\_ computes the average of values in numeric columns.
4. The SQL built-in function \_\_\_\_ obtains the largest value in a in numeric columns.
5. The SQL built-in function \_\_\_\_ obtains the smallest value in a in numeric columns.
6. The SQL built-in function \_\_\_\_ computes the number of rows in a table.
7. The functions that work with one row at a time are \_\_\_\_\_ functions.
8. To compare an aggregate value in a condition, \_\_\_\_\_ clause is used.
- 9.To get the day part of a date \_\_\_\_ function is used.
10. To get day name from a date \_\_\_\_ function is used.
11. To get the current date, \_\_\_\_\_ function is used.

**Very Short Answer Questions:**

- 1.Which SQL aggregate function is used to count all records of a table?
- 2.Write a query to display current date on your system.
- 3 Write a query to extract month part from date 3rd Feb 2021 .
- 4 Write a query to display name of weekday for date 03rd Feb 2021.

**Answers:-**

**MCO**

- 1.(b) 2.(b) and (c)

**Fill in the Blanks:**

1. WHERE 2.SUM( ) 3.AVG( ) 4.MAX( ) 5.MIN( ) 6.COUNT  
7.SINGLE ROW 8.HAVING 9.DAY ( ) 10 DAYNAME( ) 11.CURDATE( )

**Very Short Answer**

1. COUNT(\*)
2. SELECT CURDATE();
3. SELECT MONTH('2021-08-03');  
-----  
08
4. SELECT DAYNAME('2021-02-03');  
-----  
Wednesday

## ORDER BY Clause

SQL **Order By** is used to sort the data in the ascending or descending order.

- By default, SELECT returns rows in **no particular order**.
- **ORDER BY** returns the rows in a given **sort order**.
- Rows can be returned in **ascending or descending** sort order.
- It sorts the data in **ascending** order by **default**.
- To sort the data in **descending** order we use the **DESC** keyword.

**ORDER BY** syntax.

1. SELECT column-names
2. FROM table-name
3. WHERE condition
4. ORDER BY column-names [ASC, DESC]

**column-names** -- one or more column names on which to sort on.

**ASC** -- ascending sort order: low to high, a to z. This is the default.

**DESC** -- descending sort order: high to low, z to a.

**Example 1: Consider the employees table having the following records –**

empid	empname	salary	managerid	deptid
100	Aman	24000	NULL	90
101	Arathi	17000	100	90
102	Hrishikesh	17000	100	90
103	Kevin	9000	102	60
104	Athul	6000	103	60
105	Arun	4800	103	60
106	Akash	4800	103	60
107	Alan	4200	103	60
108	Gagan	12000	101	50
109	Sneha	9000	108	50
110	Arya	8200	108	50
111	Rahul	7700	108	50
112	Rohit	7800	108	50
113	Anaswer	6900	108	50

14 rows in set (0.00 sec)

SQL Query to List all employees in alphabetical order:

```
mysql>SELECT empid, empName,salary FROM employees ORDER BY empName;
```

Output:

empid	empName	salary
106	Akash	4800
107	Alan	4200
100	Aman	24000
113	Anaswer	6900
101	Arathi	17000
105	Arun	4800
110	Arya	8200
104	Athul	6000
108	Gagan	12000
102	Hrishikesh	17000
103	Kevin	9000
111	Rahul	7700
112	Rohit	7800
109	Sneha	9000

14 rows in set (0.06 sec)

List all employees in reverse alphabetical order:

```
mysql>SELECT empid, empName,salary FROM employees ORDER BY empName DESC;
```

output:

empid	empName	salary
109	Sneha	9000
112	Rohit	7800
111	Rahul	7700
103	Kevin	9000
102	Hrishikesh	17000
108	Gagan	12000
104	Athul	6000
110	Arya	8200
105	Arun	4800
101	Arathi	17000
113	Anaswer	6900
100	Aman	24000
107	Alan	4200
106	Akash	4800

14 rows in set (0.00 sec)

### Example 2

Consider the following table orders.

order_id	customer_name	city	order_total	order_date
1000	Peter	Kannur	117.79	2020-12-28
1001	Manju	Kozhikode	95.73	2020-06-14
1002	Manjith	Kannur	37.28	2021-06-23
1003	Noreen	Kochi	95.55	2020-11-05
1004	Alex	Thrissur	115.85	2021-10-06
1005	Rahul	Bangalore	123.7	2020-06-11
1006	Ardera	Trivandrum	88.2	2021-07-02
1007	Navneth	Mumbai	52.68	2020-05-05
1008	Honey	Thrissur	124.01	2020-09-10
1009	Joy	Kozhikode	58.99	2020-08-28

a) Display the details in ascending order of customer name

```
mysql>SELECT * FROM orders ORDER BY customer_name;
```

output:

order_id	customer_name	city	order_total	order_date
1004	Alex	Thrissur	115.85	2021-10-06
1006	Ardera	Trivandrum	88.2	2021-07-02
1008	Honey	Thrissur	124.01	2020-09-10
1009	Joy	Kozhikode	58.99	2020-08-28
1002	Manjith	Kannur	37.28	2021-06-23
1001	Manju	Kozhikode	95.73	2020-06-14
1007	Navneth	Mumbai	52.68	2020-05-05
1003	Noreen	Kochi	95.55	2020-11-05
1000	Peter	Kannur	117.79	2020-12-28
1005	Rahul	Bangalore	123.7	2020-06-11

- a) Display the details in descending order of their order\_date.  
Mysql>SELECT \* FROM orders order BY order\_date;

*Output:*

order_id	customer_name	city	order_total	order_date
1007	Navneth	Mumbai	52.68	2020-05-05
1005	Rahul	Bangalore	123.7	2020-06-11
1001	Manju	Kozhikode	95.73	2020-06-14
1009	Joy	Kozhikode	58.99	2020-08-28
1008	Honey	Thrissur	124.01	2020-09-10
1003	Noreen	Kochi	95.55	2020-11-05
1000	Peter	Kannur	117.79	2020-12-28
1002	Manjith	Kannur	37.28	2021-06-23
1006	Ardera	Trivandrum	88.2	2021-07-02
1004	Alex	Thrissur	115.85	2021-10-06

### Group By in SQL:

- The usage of SQL GROUP BY clause is, to divide the rows in a table into smaller groups.
- The **GROUP BY** clause is used with the SELECT statement to make a group of rows based on the values of a specific column or expression.
- The SQL AGGREGATE function can be used to get summary information for every group and these are applied to an individual group.
- The **WHERE** clause is used to retrieve rows based on a certain condition, but it can not be applied to grouped results.
- When some rows are retrieved from a grouped result against some condition, that is possible with the **HAVING** clause.

**GROUP BY** syntax:

```
SELECT <column_list> FROM < table name > WHERE <condition> GROUP BY <columns>
```

```
[HAVING] <condition>;
```

### Example 1

Consider the employees table having the following records –

empid	empname	salary	managerid	deptid
100	Aman	24000	NULL	90
101	Arathi	17000	100	90
102	Hrishikesh	17000	100	90
103	Kevin	9000	102	60
104	Athul	6000	103	60
105	Arun	4800	103	60
106	Akash	4800	103	60
107	Alan	4200	103	60
108	Gagan	12000	101	50
109	Sneha	9000	108	50
110	Arya	8200	108	50
111	Rahul	7700	108	50
112	Rohit	7800	108	50
113	Anaswer	6900	108	50

14 rows in set (0.00 sec)

### SQL GROUP BY with COUNT() function

The following query displays the number of employees working in each department.

```
mysql>SELECT deptid "Department Code", COUNT(*) "No of Employees" FROM employees  
GROUP BY deptid;
```

Department Code	No of Employees
50	6
60	5
90	3

3 rows in set (0.14 sec)

### SQL GROUP BY with SUM() function

The following query displays total salary paid to employees working in each department.

```
mysql>SELECT deptid, SUM(salary) FROM employees GROUP BY deptid;
```

```
+-----+-----+
| deptid | SUM(salary) |
+-----+-----+
|      50 |      51600 |
|      60 |      28800 |
|      90 |      58000 |
+-----+-----+
3 rows in set (0.00 sec)
```

### SQL GROUP BY with COUNT() and SUM() function

The following query displays number of employees, total salary paid to employees work in each department.

```
mysql>SELECT deptid "Department Code", COUNT(*) "No of Employees", SUM(salary)
      "Total Salary" FROM employees GROUP BY deptid;
```

Output:

```
+-----+-----+-----+
| Department Code | No of Employees | Total Salary |
+-----+-----+-----+
|          50    |          6      |      51600 |
|          60    |          5      |      28800 |
|          90    |          3      |      58000 |
+-----+-----+-----+
3 rows in set (0.00 sec)
```

### SQL GROUP BY with WHERE clause

The following query displays the department code, total salary paid to employees group by department\_id and manager\_id=103.

```
mysql>SELECT deptid "Department Code", SUM(salary) "Total Salary" FROM employees
      WHERE managerid = 103 GROUP BY deptid;
```



Output:

```
+-----+-----+
| Department Code | Total Salary |
+-----+-----+
|           60 |         19800 |
+-----+-----+
1 row in set (0.00 sec)
```

### SQL GROUP BY with HAVING clause

The following query displays the department id, number of employees of those groups that have more than 3 employees:

```
mysql>SELECT deptid, count(*) "No. of Employee" FROM employees GROUP BY deptid
HAVING count(*)>3;
```

Output:

```
+-----+-----+
| deptid | No. of Employee |
+-----+-----+
|      50 |                6 |
|      60 |                5 |
+-----+-----+
2 rows in set (0.00 sec)
```

## Example 2

Consider the following table orders.

order_id	customer_name	city	order_total	order_date
1000	Peter	Kannur	117.79	2020-12-28
1001	Manju	Kozhikode	95.73	2020-06-14
1002	Manjith	Kannur	37.28	2021-06-23
1003	Noreen	Kochi	95.55	2020-11-05
1004	Alex	Thrissur	115.85	2021-10-06
1005	Rahul	Bangalore	123.7	2020-06-11
1006	Ardera	Trivandrum	88.2	2021-07-02
1007	Navneth	Mumbai	52.68	2020-05-05
1008	Honey	Thrissur	124.01	2020-09-10
1009	Joy	Kozhikode	58.99	2020-08-28

a) Find the total revenue generated from each city.

```
mysql>SELECT city, SUM(order_total) 'revenue' FROM orders  
GROUP BY city;
```

Output:

city	revenue
Bangalore	123.7
Kannur	155.07
Kochi	95.55
Kozhikode	154.72
Mumbai	52.68
Thrissur	239.86
Trivandrum	88.2

a) Find the total number of orders from different cities.

```
mysql>SELECT city, COUNT(*) 'no_of_orders' FROM orders GROUP BY city;
```

**Output:**

city	no_of_orders
Bangalore	1
Kannur	2
Kochi	1
Kozhikode	2
Mumbai	1
Thrissur	2
Trivandrum	1

a) Display cities with more than one order

```
Mysql>SELECT city, COUNT(*) 'no_of_orders' FROM orders GROUP BY city  
having COUNT(*)>1;
```

**Output:**

city	no_of_orders
Kannur	2
Kozhikode	2
Thrissur	2

a) Display the cities where the sum of revenue is 150 or more.

```
Mysql> SELECT city, SUM(order_total) 'revenue' FROM orders  
GROUP BY city HAVING SUM(order_total) >= 150;
```

**Output:**

city	'revenue'
Kannur	155.07
Kozhikode	154.72
Thrissur	239.86

a) Find the maximum & minimum revenue for each city.

```
mysql>SELECT city, min(order_total) ,max(order_total) FROM orders
```

```
GROUP BY city;
```

Output:

city	min(order_total)	max(order_total)
Bangalore	123.7	123.7
Kannur	37.28	117.79
Kochi	95.55	95.55
Kozhikode	58.99	95.73
Mumbai	52.68	52.68
Thrissur	115.85	124.01
Trivandrum	88.2	88.2

### Questions

- Which of the following would arrange the rows in ascending order in SQL.  
a. SORT BY    b. ALIGN BY    c. GROUP BY    d. ORDER BY
- Prachi has given the following command to obtain the highest marks  
Select max(marks) from student where group by class;  
but she is not getting the desired result. Help her by writing the correct command.  
a. Select max(marks) from student where group by class;  
b. Select class, max(marks) from student group by marks;  
c. Select class, max(marks) group by class from student;  
d. Select class, max(marks) from student group by class;
- Help Ritesh to write the command to display the name of the youngest student?  
a. select name,min(DOB) from student ;  
b. select name,max(DOB) from student ;  
c. select name,min(DOB) from student group by name ;  
d. select name,maximum(DOB) from student;
- A relation 'Vehicles' is given below :

V_no	Type	Company	Price	Qty
AW125	Wagon	Maruti	250000	25
J0083	Jeep	Mahindra	4000000	15
S9090	SUV	Mitsubishi	2500000	18
M0892	Mini van	Datsun	1500000	26
W9760	SUV	Maruti	2500000	18
R2409	Mini van	Mahindra	350000	15

Write SQL commands to:

- Display the average price of each type of vehicle having quantity more than 20.
- Count the type of vehicles manufactured by each company.
- Display the total price of all the types of vehicles.

5. Consider the table 'FANS' and answer the following.

FAN_ID	FAN_NAME	FAN_CITY	FAN_DOB	FAN_MODE
F001	SUSHANT	MUMBAI	1998-10-02	MAIL
F002	RIYA	MUMBAI	1997-12-12	LETTER
F003	ANIKA	DELHI	2001-06-30	BLOG
F004	RUDRA	AJMER	2005-08-22	MAIL
F006	MIARA	KOLKATTA	1998-11-01	BLOG

Write MySQL queries for the following:

- To display the details of fans in descending order of their DOB
  - To count the total number of fans of each fan mode
  - To display the dob of the youngest fan.
6. Write commands in SQL for (i) and (ii) and output for (iii).

**Table : Store**

StoreId	Name	Location	City	NoOfEmp	DateOpen	SalesAmt
S101	Planet Fashion	Bandra	Mumbai	7	2015-10-16	40000
S102	Vogue	Karol Bagh	Delhi	8	2015-07-14	120000
S103	Trends	Powai	Mumbai	10	2015-06-24	30000
S104	Super Fashion	Thane	Mumbai	11	2015-02-06	45000
S105	Annabelle	South Extn.	Delhi	8	2015-04-09	60000
S106	Rage	Defence Colony	Delhi	5	2015-03-01	20000

- To display the details of the store in alphabetical order of name.
  - To display the City and the number of stores located in that City, only if the number of stores is more than 2.
- (iii) `SELECT COUNT(STOREID), NOOFEMP FROM STORE GROUP BY NOOFEMP HAVING MAX(SALESAMT)<60000;`

Answers

1. *d*
2. *d*
3. *b*
- 4.

- a. *select Type, avg(Price) from Vehicle group by Type having Qty>20;*
- b. *select Company, count(distinct Type) from Vehicle group by Company;*
- c. *Select Type, sum(Price\* Qty) from Vehicle group by Type;*

5.

- i. *SELECT \* FROM FANS ORDER BY FAN\_DOB DESC;*
- ii. *SELECT FAN\_MODE, COUNT(\*) FROM FANS GROUP BY FAN\_MODE;*
- iv. *SELECT MAX(FAN\_DOB) FROM FANS;*

6.

- (i) *SELECT \* FROM STORE ORDER BY NAME;*
- (ii) *SELECT CITY, COUNT(\*) FROM STORE GROUP BY STORE HAVING COUNT(\*)>2;*
- (iii) *Count(StoreId) | NoOfEmp |*

+-----	+-----	+
1	10	
1	11	
1	5	
1	7	
+-----	+-----	+

### Try yourself

Consider the following table:

Table : School

Admno	Name	Class	House	Percentage	Gender
20150001	Abhishek Kumar	10	Green	86	Male
20140212	Mohit Bhardwaj	11	Red	75	Male
20090234	Ramandeep Kaur	10	Yellow	84	Female
20130216	Mukesh Sharma	9	Red	91	Male
20190227	Rahil Arora	10	Blue	70	Male
20120200	Swapnil Bhatt	11	Red	64	Female

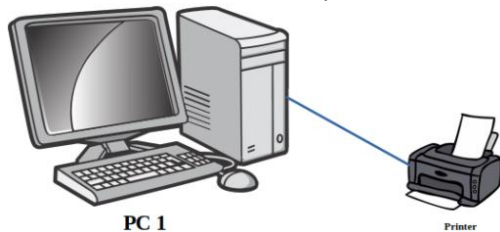
Write SQL-queries for the following:

- a) Display the total number of students in each House where the number of students are more than 2.
- b) Display the average Percentage of girls and boys.
- c) Display the minimum Percentage secured by the students of Class 10.

## Unit 3:

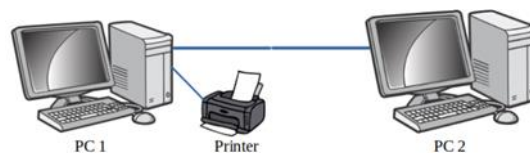
### Introduction to Computer Networks

Consider a standalone computer connected to a printer.



This computer is useful for a particular person at a time. Every time we need to access the files from this PC the user needs to personally sit by it and work.

#### Concept of networking – Interconnection of Computers



Now we have connected PC 1 with PC 2. This is the most simple form of a computer network. The data/information in PC 1 can be accessed from PC 2 and vice-versa. Also printer can be used from both PC 1 and PC 2.

Advantages of using computer networks

- **Resource sharing**:-Resource sharing makes it possible to use resources economically, for example, to manage peripheral devices, such as laser printers, from all connected systems.
- **Data separation** :-Data separation provides the ability to access and manage databases from peripheral workstations that need information
- **Separation of software tools**:- The separation of software tools provides the possibility of simultaneous use of centralized, previously installed software tools.
- **CPU resource sharing**:- With the separation of processor resources, it is possible to use computing power for data processing by other systems that are part of the network.
- **Multiuser mode**:-The multi-user properties of the system facilitate the simultaneous use of centralized application software tools previously installed and managed, for example, if the user of the system is working with another task, then the current work performed is pushed into the background.

#### Where to connect the network cable while networking and form of cabling



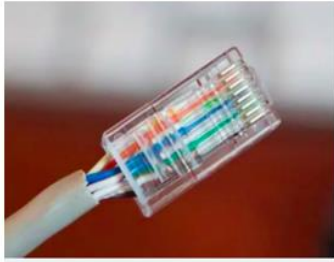
Cat 6 Network Cable



RJ 45 Connector



The network cable is connected to a RJ-45 connector(RJ – Registered Jack).



RJ 45 with network cable attached



Network port



Network cable connected to port

## **Evolution of Computer Network - Types of computer network:**

There is no single system that satisfies all computer networks. For classification, specific characteristics are distinguished that allow the networks to be divided into separate types.

The following is the different types of network based on size of computer networks:

### **PAN**

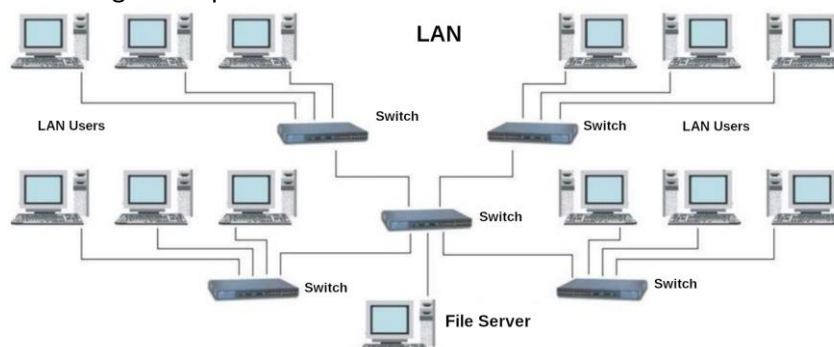
A Personal Area Network (PAN) allows devices to exchange data over short distances. PAN combines devices such as mice, keyboards, printers, smartphones, tablets, etc. The most common connection technology is Bluetooth. Bluetooth can give a range of upto 10metres.



### **LAN**

A Local Area Network (LAN) is a computer network that, as a rule, covers a small area, located in one or more buildings

The term "local" in this context refers to joint local management (does not mean the mandatory physical proximity of components to each other). A local network can be a home network, a combination of computers and other devices of a small office or a large enterprise.



Wired connections are widely used in LAN, most of which are made using copper wires, and some are fiber—optic. Usually, wired networks operate at speeds from 100 Mbit/s to 1 Gbit/s. More modern LAN can operate at a speed of

10 Gbit/s. The most common wired connection standard is the IEEE 802.3 standard, commonly referred to as Ethernet.

In local area networks, along with wired technologies, wireless connections according to the IEEE 802.11 standard, better known as **Wi-Fi**, are widely used.

Wireless Wi-Fi networks operate at speeds from several to hundreds of megabits per second.

**The size of LAN networks ranges from 10metres to 1 Km**

### MAN

Metropolitan area network(MAN) unite computers within a city. As an example, we can consider a cable television system in which it became possible to transmit digital data and, over time, the system turned into a computer network.

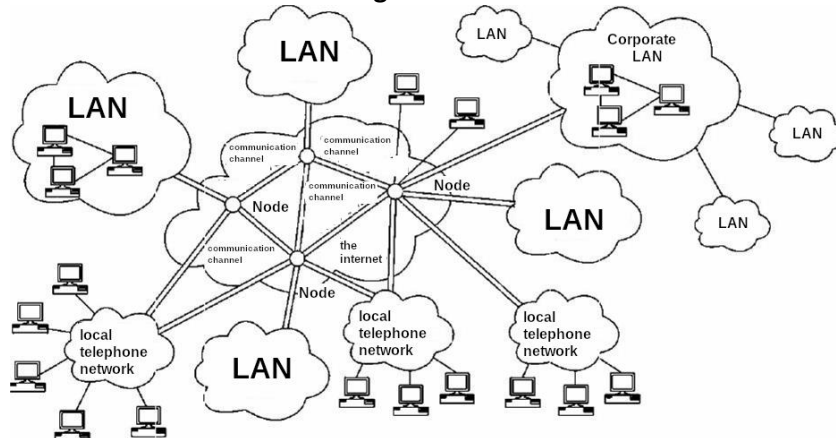
**The size of MAN networks range from 1 Km to 10Km.**

### WAN

The Wide Area Network(WAN) covers significant territories, connects local networks that can be located in geographically remote areas. A global network is similar to a large wired local area network, but there are important differences:

- management of local networks and provision of access to the inter-network data transmission environment is carried out by various organizations;
- networks using different types of network technologies can be connected;
- with the help of communication channels, individual computers can communicate with local networks, or entire networks.

The Internet can be considered as a WAN. **A WAN ranges from 100km to 10000km.**



### Network devices

We cannot always make sure that there is a dedicated connection from one computer to another one in a computer network. Further the data travels over the telephone network. Hence there arises the need for different types of devices in computer networks. **Network devices provide transportation of data that needs to be transferred between end-user devices.** They extend and combine cable connections, convert data from one format to another, and control data transmission. Examples of devices that perform these functions are repeaters, hubs, switches, and routers.

### Network card (NIC/NIU/TAP)

The devices that connect the end user to the network are also called terminal nodes. An example of such devices is an ordinary personal computer. To work on the network, each host is equipped with a **network Interface card (NIC)**, also called a network adapter. As a rule, such devices can function without a computer network.

**A network adapter is a printed circuit board that is inserted into a slot on the motherboard of a computer, or an external device.** Each NIC adapter has a unique code called a **MAC address**. This address is used to organize the operation of these devices on the network.

### **Repeater**

Repeaters are network devices operating at the first (physical) level of the OSI reference model. As the data leaves the sender's device and enters the network, they are converted into electrical or light pulses, which are then transmitted over the network transmission medium. Such pulses are called signals. When the signals leave the transmitting station, they are clear and easily recognizable. However, the longer the cable length, the weaker and less distinguishable the signal becomes as it passes through the network transmission medium. The purpose of using a repeater is to regenerate and resynchronize network signals, which allows them to be transmitted over a longer distance through the medium.

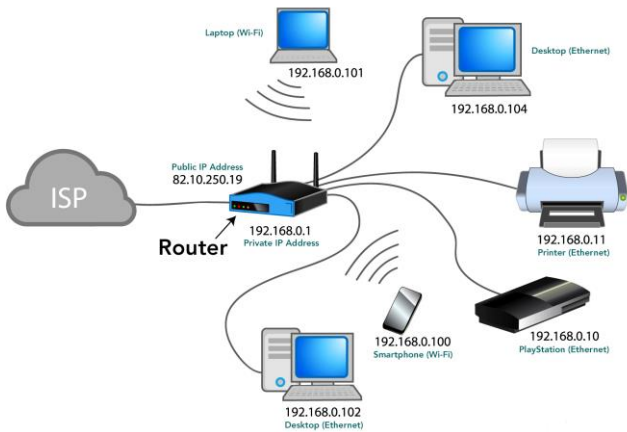
### **Hub**

Hub is a network device used to combine devices. The hub can have from 8 to 32 ports for connecting computers. All the information that comes to the connector of one port will be copied automatically and sent to ALL other ports. The simplest hub is a multiport repeater.

### **Router**

A router is a network device that facilitates and establishes a connection between a local network and the Internet by transmitting information to and from packet-switched networks. It performs this function by analyzing the data packet header, which contains the IP address of the packet destination. Based on the data packet, the router determines the most efficient route to the destination address. Simply put, a router routes information between connected networks.

The router is physically connected to the modem and other devices. The router creates a private network by receiving data from the Internet from the modem, which is connected via cable, DSL or other wired connection from an Internet service provider. Routers have several ports from which you can connect to devices to distribute Internet connectivity. By means of communication between modems and devices in the local network, the router facilitates communication with the Internet and within the network. The router provides connectivity at the network level of the system and thus functions at the third level of the OSI model.

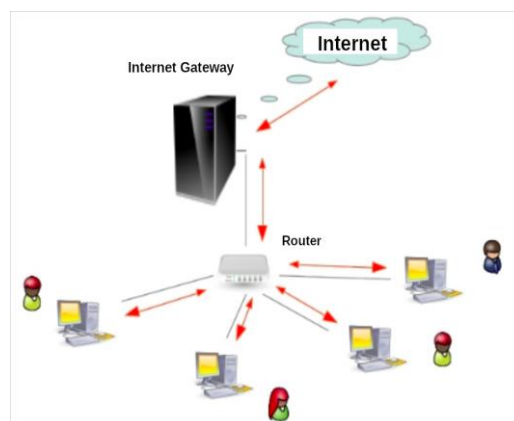


### Working of a Router

This device also performs the functions of the Dynamic Host Configuration Protocol (DHCP), distributing private IP addresses between devices connected to the network. Routers for home or office have a private or local address obtained from a reserved range of IP addresses. Devices on the network can have the same private IP address as devices in the neighbouring house. This is not a problem, since the devices are separately connected to different routers with a specific public IP address. Thus, the private IP address functions only so that the router can identify the device.

### Gateway

A gateway is considered as a network device that acts as an entry point from one network to another. The main task of a network gateway is to convert protocol(rules for communication over the data network) between networks. A network gateway can accept a packet formatted for one protocol (for example, Apple Talk) and convert it into a packet of another protocol (for example, TCP/IP) before sending it to another network segment. Network gateways can be a hardware solution, software, or both, but usually it is software installed on a router or computer. The network gateway must understand all the protocols used by the router.



Working of Gateway

## Switch

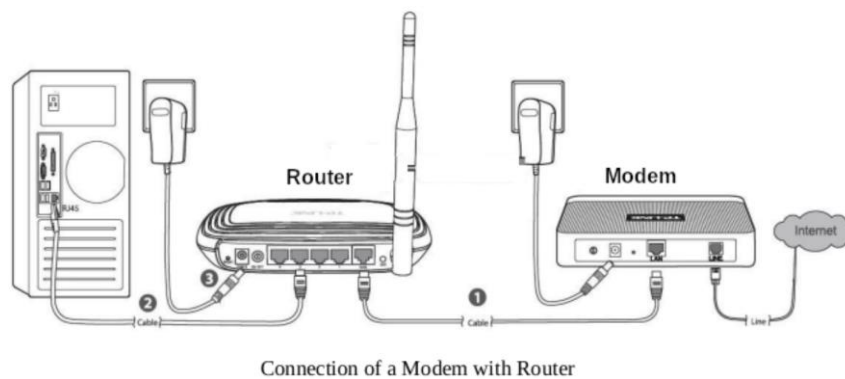
A switch is used to connect computers, laptops and other devices to a shared local network. For example, take a large company with dozens and hundreds of employees. There is a marketing department, a sales department, financiers, a director. They need to exchange information, use common tables and programs. Doing this via the Internet is inconvenient and dangerous (if we talk about observing trade secrets). It is better to combine working computers into a common closed network, where there is no access to outsiders. For large video surveillance systems, switches are also needed. Switches are also used at home.



## Modem modulator / demodulator

A modem is a device that converts a digital signal into an analog signal and vice versa. The modem connects the user's computer or laptop to the Internet. It works in two directions at once:

- Receives a digital signal from a PC, converts it to analog (in the form of a wave) and transmits the request to the servers storing the necessary information;
- Receives the response to the sent request in analog form, converts it to digital and transmits it to the PC



Nowadays the router and modem are combined together in a single device. The device is called a router.

## Supplementary notes on Network Model and Addressing methods

### Network model

The OSI model, is the core on which any modern network and devices connected to it are managed and interact. There are 7 levels in the OSI model.

Level	Name of layer	Devices working in the layer
Level 7	Application	-
Level 6	Presentation	-
Level 5	Session	-
Level 4	Transport	-
Level 3	Network	Router, Gateway
Level 2	Data link.	Network Switch, Modem

### Addressing of Devices in Computer Networks:

Each network computer has as many as three addresses: physical (MAC address), network (IP address) and symbolic (regular computer name or full domain name)

To transmit data in local and global networks, the sending device must know the address of the receiving device. Therefore, each network computer has a unique address, and not one, but as many as three addresses: physical or hardware (MAC address); network (IP address); symbolic (regular computer name or full domain name).

#### Physical address of the computer

The physical (hardware) address of the computer depends on the technology with which the network is built. In Ethernet networks, this is the MAC address of the network adapter. The MAC address is hard-wired into the network card by its manufacturer and is usually written as 12 hexadecimal digits (for example, 00-03-BC-12-5D-4E).

This is guaranteed to be a unique address: the first six characters identify the manufacturer, which ensures that the remaining six characters are not repeated on the production line. The MAC address is selected by the network equipment manufacturer from the address space allocated for it under the license. When a machine's network adapter is replaced, its MAC address also changes.

You can find out the MAC address of your computer's network card as follows:

1. Go to "Start" – "Run" - enter the command cmd – "OK" from the keyboard.
2. Enter the ipconfig /all command and press Enter.

This command allows you to get complete information about all PC network cards. Therefore, find the Physical address line in this window – it will indicate the MAC address of your network card.

#### The network address of the computer

The network address or IP address is used in TCP/IP networks when exchanging data at the network level. IP stands for Internet Protocol . The computer's IP address is 32 bits long and consists of four parts called octets. Each octet can take values from 0 to 255 (for example, 90.188.125.200). Octets are separated from each other by dots.

The IP address of a computer, for example 192.168.1.10, consists of two parts – the network number (sometimes called the network identifier) and the network computer number (host identifier). The

network number must be the same for all computers on the network and in our example the network number will be 192.168.1. The computer number must be unique in this network, and the computer in our example has the number 10.

The IP addresses of computers on different networks may have the same numbers. For example, computers with IP addresses 192.168.1.10 and 192.168.15.10, although they have the same numbers (10), but belong to different networks (1 and 15). Since the network addresses are different, computers cannot be confused with each other.

The IP addresses of computers on the same network should not be repeated. For example, it is unacceptable to use the same addresses 192.168.1.20 and 192.168.1.20 for two computers on your local network. This will lead to their conflict. If you turn on one of these computers earlier, when you turn on the second computer, you will see a message about an erroneous IP **address:conflict** of IP addresses with another system on the net in this case, just change the address on one of the computers.

To separate the network number from the computer number, a subnet mask is used. Outwardly, the subnet mask is the same set of four octets separated by dots. But, as a rule, most of the digits in it are 255 and 0.

If your computer is connected to a local network or the Internet, you can find out its IP address and subnet mask in a way that is already familiar to us:

1. Go to "Start" – "Run" - type cmd and click OK.
2. In the window that opens, enter the ipconfig /all command and press Enter.

You will see the computer's IP address and subnet mask in the corresponding lines:

Internal IP addresses are reserved for local networks (they cannot be accessed via the Internet without special software) from the ranges:

192.168.0.1 – 192.168.254.254

10.0.0.1 – 10.254.254.254

172.16.0.1 – 172.31.254.254

From these ranges, you, as a system administrator, will assign addresses to computers in your local network. If you "rigidly" fix the IP address in the computer settings, then such an address will be called static – it is a permanent, unchangeable IP address of the PC.

There is another type of IP addresses – dynamic, which change every time a computer enters the network. The DHCP service is responsible for managing the dynamic address allocation process.

### **Name of the network computer**

In addition to physical and network addresses, a computer can also have a symbolic address – the name of the computer. The computer name is a more convenient and understandable designation for a computer on the network.

## Questions:

1. The length of a network segment in a LAN network is more than 100meters. Select the device to be connected to maintain the strength of signal:
  - a. Switch
  - b. Router
  - c. Gateway
  - d. Repeater
2. Select the device that helps to transfer the digital signals to be transferred over telephone lines:
  - a. Switch
  - b. Modem
  - c. Gateway
  - d. Repeater
3. Which of the following devices causes congestion if conneced in a Computer Network?
  - a. Switch
  - b. Modem
  - c. Gateway
  - d. Hub
4. The System Administrator at Gyan international school wants to connect the LAN network at the school to the internet. Help him to choose the correct device for the job:
  - a. Switch
  - b. Repeater
  - c. Router
  - d. Hub
5. The Gyan international school has installed 40 computers in its Computer lab. Choose the correct device to form a LAN network involving the 40 computers.
  - a. Switch
  - b. Repeater
  - c. Gateway
  - d. Hub
6. The device used to connect two networks using different protocols is:
  - a. Router
  - b. Repeater
  - c. Gateway
  - d. HUB
7. The connector used for networking is:
  - a. RJ - 11
  - b. RI – 11
  - c. RJ - 45
  - d. RI- 45
8. What is the difference between a Hub and a Switch?
9. What is the difference between a Router and a Gateway ?



**Solutions:**

1. d. Repeater – The repeater amplifies the input signal to make up the loss in strength.
2. b. Modem – Modulator-Demodulator converts digital signal to analog and vice-versa.
3. d. Hub -
4. c. Router
5. a. Switch
6. c. Gateway
7. c. RJ – 45 . RJ stands for Registered Jack.
8. The hub receives network data on one port and simply send information to all devices Connected to it. Such data transmission has disadvantages:
  - a. Heavy load on the network (data is sent to all computers on the network at once);
  - b. A large number of errors, especially when new computers appear;
  - c. It is impossible to separate the flows of information, to send it in a targeted manner.
8. A gateway is a network device that allows a network to communicate with another network with other protocols (rules for communication). Gateways act as a network point that acts as an entrance to another network. A router connects two or more data lines, so when a packet arrives through one line, the router reads the packet address information and determines the correct destination. These days, routers are mostly available with built-in gateway systems, making it easier for users who don't need to buy separate systems.

**Networking Topologies:**

**Topologies:** The arrangement of computers and other peripherals in a network is called its topology. Common network topologies are **bus, star mesh, and tree**

**Bus Topology**

In bus topology all the nodes are connected to a main cable called backbone. If any node has to send some information to any other node, it sends the signal to the backbone. The signal travels through the entire length of the backbone and is received by the node for which it is intended. A small device called terminator is attached at each end of the backbone. When the signal reaches the end of backbone, it is absorbed by the terminator and the backbone gets free to carry another signal.

**Characteristics of Bus topology:**

- ✓ It is easy to install.
- ✓ It requires less cable length
- ✓ It is cost effective.
- ✓ Failure of a node does not affect the network.
- ✓ Fault diagnosis is difficult.
- ✓ At a time only one node can transmit data.

### **Star Topology:**

In star topology each node is directly connected to a hub/switch. Star topology generally requires more cable than bus topology.

### **Characteristics of Star topology:**

- It is more efficient topology
- It is easy to install
- It is easy to diagnose the fault
- It is easy to expand
- Failure of hub/switch leads to failure of entire network
- It requires more cable length
- 

### **Tree Topology:**

Tree topology is a combination of bus and star topologies. It is used to combine multiple star topology networks. All the stars are connected together like a bus.

### **Characteristics of Tree topology:**

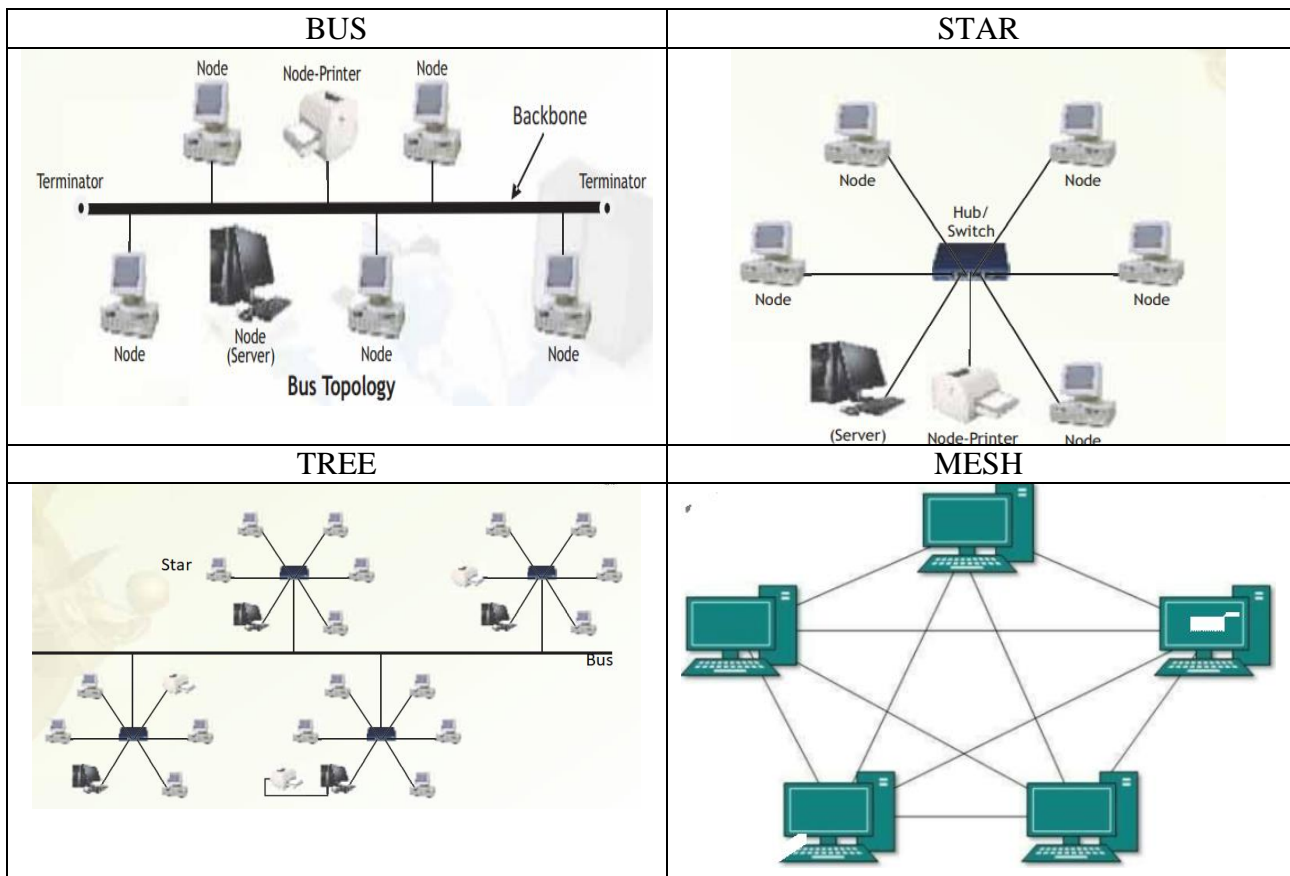
- It offers easy way of network expansion.
- If one network (star) fails, the other networks remain connected and working.

### **Mesh Topology :**

In this networking topology, each communicating device is connected with every other device in the network. To build a fully connected mesh topology of n nodes, requires  $n(n-1)/2$  wires.

### **Characteristics of Mesh topology:**

- Failure during a single device won't break the network.
- There is no traffic problem.
- It provides high privacy and security.
- A mesh doesn't have a centralized authority.
- It's costly.
- Installation is difficult



## Introduction to Internet:

The Internet is the global network of computing devices including desktop, laptop, servers, tablets, mobile phones, other handheld devices as well as peripheral devices such as printers, scanners, etc. In addition, it consists of networking devices such as routers, switches, gateways, etc. Today, smart electronic appliances like TV, AC, refrigerator, fan, light, etc., can also communicate through the Internet.

### Applications of Internet

- The World Wide Web (WWW)
- Electronic mail (Email)
- Chat
- Voice Over Internet Protocol (VoIP)

**The World Wide Web (WWW):** The World Wide Web (WWW) or web in is information stored in interlinked web pages and web resources. The resources on the web can be shared or accessed through the Internet. Three fundamental technologies HTML, URL and HTTP leads to creation of web.

**URL :** A Uniform Resource Locator (URL) is a standard naming convention used for accessing resources over the Internet. URL is sometimes also called a web address. In below URL, http is the protocol name, it can be https, http, FTP, Telnet, etc. www is a sub domain. ncert.nic.in is the domain name



**Electronic mail (Email) :** Electronic mail is a means of sending and receiving message(s) through the Internet. The message can be either text entered directly onto the email application or an attached file (text, image audio, video, etc.) stored on a secondary storage. To use email service, one needs to register with an email service provider by creating a mail account.

**Chat :** Chatting or Instant Messaging (IM) is communicating in real time using text message(s).

**Voice Over Internet Protocol (VoIP):** Voice over Internet Protocol (VoIP) allows you to have voice calls over digital networks.

**Points To Remember :**

- ★ In Bus topology Nodes connected using single wire, cost effective, easy to install and fault diagnose is difficult.
- ★ In star topology each Nodes is directly connected to hub/switch easy to install, expensive and easy to diagnose faults.
- ★ Tree is combination of star and bus.
- ★ Mesh topology each device is connected to every other device. No centralized device, and expensive
- ★ WWW (World Wide Web )where documents and other web resources are identified by Uniform Resource Locator.
- ★ URL is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it.
- ★ Chat is real time texting.
- ★ VoIP allows voice calls.

**Questions:**

1. Physical arrangement of computers in a network is called network is called \_\_\_\_.
2. In \_\_\_\_ topology all the nodes are connected to a single cable.
3. Network topology in which you connect each node to the network along a single piece of cable is called \_\_\_\_\_
4. In \_\_\_\_\_ Topology, a dedicated link connects device to central controller
5. In Star topology if central hub fails, it effects
  - a. No effects
  - b. Entire system
  - c. Particular Node
6. Which of the following topologies is a combination of more than one topologies?
  - a. Bus
  - b. Tree
  - c. Star
  - d. None of these
7. Identify the type of topology from the following:
  - a) Each node is connected with the help of a single cable.
  - b) Each node is connected with central switching through independent cables.
8. Illustrate the layout for connecting 5 computers in a Bus and a Star topology of Networks.
9. Identify valid URL from the following
  - a. <http://www.cbse.nic.in/welcome.htm>, b . [www.cbse.nic.in/ http://welcome.htm](http://www.cbse.nic.in/http://welcome.htm)
  - c . [http:// welcome.htm](http://welcome.htm)
10. Identify the protocol from the following .  
<http://www.cbse.nic.in/welcome.htm>

11. Guru wants to send a report on his trip to the North East to his mentor. The report contains images and videos. How can he accomplish his task through the Internet?
12. URL stands for
13. VoIP stands for
14. Name the protocol allows to have the voice call over the Internet
15. Which of the following will you suggest to establish the real-time textual communication between the people.
  - a. E-mail
  - b. Video Conferencing
  - c. Chatting
  - d. Real time communication is not possible

**Answers:**

1. Topology
2. Bus.
3. Bus
4. Star
5. Entire system
6. Tree
7. (a). BUS (b). Star
- 8.

**Bus topology**



**Star Topology**



9. <http://www.cbse.nic.in/welcome.htm>
10. http
11. E-mail
12. Uniform Resource locator
13. Voice over Internet Protocol
14. VoIP
15. Chatting

### **Website:-**

Website is a group of web pages, containing text, images and all types of multi-media files

### **Difference between Website and Webpage**

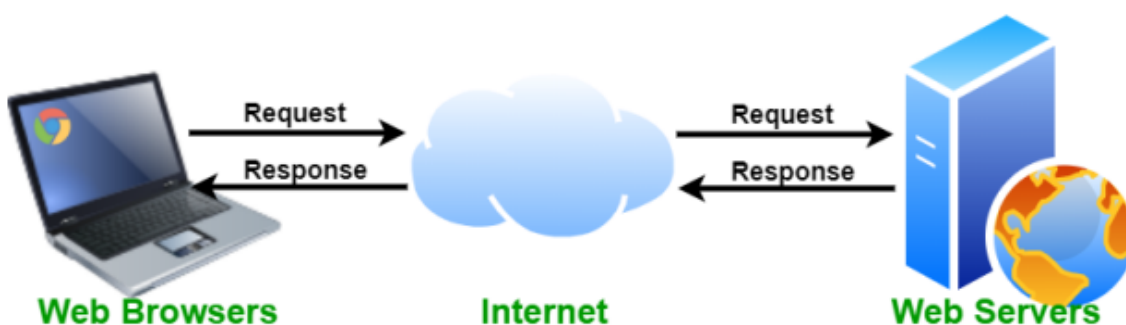
Website	WebPage
A collection of web pages which are grouped together and usually connected together in various ways, Often called a "web site" or simply a "site." Eg: CBSE website	A document which can be displayed in a web browser such as Firefox, Google Chrome, Opera, Microsoft Internet Explorer etc Result web page of CBSE
Contains information about various topics	Contents information about single topic
Web Site address doesn't depend upon webpage address	Depends upon web page address
Development time is more	Less Development time required

### **Difference between Static and Dynamic webpage**

Static webpage content is constant in all time	The page content changes according to the user.
Loading time is less	Loading time is more
No database is used	A database is used in the server side
Content changes rarely	Content changes constantly

### **Web Server :-**

A web server is a computer that stores web server software and a website's component files (e.g. HTML documents, images, CSS style sheets, and JavaScript files). When client sends request for a web page, the web server search for the requested page if requested page is found then it will send it to client with an HTTP response. If the requested web page is not found, web server will the send an HTTP response :Error 404 Not found.



**Web Hosting :-**

Web hosting is an online service that enables you to publish your website or web application on the internet. When you sign up for a hosting service, you basically rent some space on a server on which you can store all the files and data necessary for your website to work properly. A server is a physical computer that runs without any interruption so that your website is available all the time for anyone who wants to see it

**Web Browser :-** A web browser, or simply "browser," is an application used to access and view websites. Common web browsers include Microsoft Internet Explorer, Google Chrome, Mozilla Firefox, and Apple Safari.

**Add-ons( in terms of Hardware):** An Add-on is either a hardware unit that can be added to a computer to increase the capabilities or a program unit that enhances primary program. Some manufacturers and software developers use the term add-on. Examples of add-ons for a computer include card for sound, graphic acceleration, modem capability and memory. Software add- on are common for games, wordprocessing and accounting programs

**Plug-ins:-** a plug-in (or plugin, add-in, add-on) is a software component that adds a specific feature to an existing computer program. When a program supports plug-ins, it enables customization. Plug-ins are commonly used in Internet browsers but also can be utilized in numerous other types of applications

**Cookies :-** cookies are small files which are stored on a user's computer and contains information like which Web pages visited in the past, logging details Password etc. They are designed to hold a small amount of data specific to a particular client and website and can be accessed by the web server or the client computer

**Multiple choice questions:**

- 1.A website is a collection of  
(a)HTML documents (b) Graphic files (c)Audio and video files (d)All of the above
- 2.The first page that we normally view at a website is called \_\_\_\_\_  
(a)Home page (b)Webpage (c) Webserver (d)Email
- 3.Which of the following is not a web browser?  
(a)Google Chrome (b) Mozilla Firefox (c)Opera (c)MS word
- 4.Which of the following is a web browser?  
(a)Adobe Photoshop (b) Coral Draw (c) Apple Safari (d) MS word
- 5.Which of the following button allows you to move to the previously visited page on the browser?  
(a) Back (B)Previous (c) Last (d)Reverse

6. Which of the following is a piece of information stored in a form of a text file and that helps in customizing the displayed information, login, showing data based on user's interests from the web site?

- (a) Extension (b) Cookies (c) Login (d) Session

7. The space provided by a service provider to store website data is called \_\_\_\_\_.

- (a) Webspace (b) Cloud Computing (c) Web Hosting (d) Web Store

8. \_\_\_\_\_ is an online service that enables you to publish your website or web application on the internet

- (a) Web server (b) Web Browser (c) Web Hosting (d) None

9. \_\_\_\_\_ is a software component that adds a specific feature to an existing computer program

- (a) Addon (b) Plug in (c) Cookies (d) All of the above

10. The first page on the website that allows you to navigate to other pages by menus or links is known as \_\_\_\_\_

- (a) front page (b) primary page (c) Home page (d) None

Fill in the blanks questions:-

1. A \_\_\_\_\_ is a collection of web pages written using HTML.
2. A computer on which the website is hosted and it is connected to the internet all time is known as \_\_\_\_\_.
3. The \_\_\_\_\_ of a website are linked together with different hyperlinks and share a common interface and design.
4. An interactive web page is created through \_\_\_\_\_
5. The space provided by a service provider to store website data is called \_\_\_\_\_

Answers

Multiple choice questions:

1.a. 2.a 3.c 4.c 5.a 6.b 7.c 8.c 9.b 10.c

Fill in the blanks:

1. Website
2. Web server
3. Web pages
4. HTML and scripting languages
5. Web Hosting



Descriptive Questions and answers:-

1. Differentiate between web browser and web server

Web Server :-

A web server is a computer that stores web server software and a website's component files (e.g. HTML documents, images, CSS style sheets, and JavaScript files). When client sends request for a web page, the web server search for the requested page if requested page is found then it will send it to client with an HTTP response. If the requested web page is not found, web server will the send an HTTP response :Error 404 Not found.

Web Browser :-

A web browser, or simply "browser," is an application used to access and view websites. Common web browsers include Microsoft Internet Explorer, Google Chrome, Mozilla Firefox, and Apple Safari

2. Differentiate between eb page and home page?

Web page:- A document using http and resides on a website is called webpage

Home page:-It is the page that gets displayed first when we open a webpage.

3. Differentiate between dynamic and static webpages?

Ans:

Static webpage content is constant in all time	The page content changes according to the user.
Loading time is less	Loading time is more
No database is used	A database is used in the server side
Content changes rarely	Content changes constantly

4. Write the steps to host a website;

Ans:-

Following steps needs to followed to host a website:

1. Go and search for the hosting provider companies online
2. Find a suitable domain name for your website
3. Register your domain name with the Domain Name Registrar
4. Once you get to space, create your login
5. Upload your localhost website files on the allocated space
6. Map you domain name with IP address

5. What are the components of a web site? Explain in detail.

1. Webhosting – A space or computer provided by a service provider to store website data
2. Address – A unique URL rendered by the browser when the request sent by the user
3. Homepage – The first page of a website when the website is launched
4. Design – The theme and interface design including the layout of the website

- 5. Content – The text, images, links, and other media files included in the web page
  - 6. Navigation Structure – A structure that navigates from one page to another
- 6.Explain the following terms:

Ans:-

(a)Website (b) Webpage (c) Homepage (d)Webserver

Web Site	Web Page	Home Page	Web Server
Group of related web pages hosted on a web server	A document that uses HTTP	The top level page of web site	A web server is a computer that stores web server software and a website's component files (e.g. HTML documents, images, CSS style sheets, and JavaScript files)