

Linux

1) Which command is used to list files in a directory?

- **Answer:** a) ls
- **Detailed Explanation:**
 - The ls command is used to list all files and directories in the current working directory.
 - Example:

bash

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ls

- Additional options:
 - ls -l → Lists files with details (permissions, owner, size, etc.).
 - ls -a → Shows hidden files (those starting with .).

2) What does the chmod command do in Linux?

- **Answer:** b) Change file permissions
- **Detailed Explanation:**
 - chmod (Change Mode) is used to modify file permissions for the owner, group, and others.
 - Example:

bash

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chmod 755 file.sh

- This means the owner can read, write, and execute (rwx), while the group and others can only read and execute (r-x).

3) The root directory in Linux is represented by:

- **Answer:** b) /
- **Detailed Explanation:**
 - / is the top-level directory in Linux from which all other directories originate.
 - Example: /home/user/Documents is inside the / directory.

4) Which of the following is a text editor in Linux?

- **Answer:** d) All of the above
- **Detailed Explanation:**
 - nano, vi, and gedit are common text editors used in Linux.
 - nano is easy to use.
 - vi is more advanced and used by professionals.
 - gedit is a graphical text editor.

5) Which process ID (PID) is assigned to the first process in Linux?

- **Answer:** b) 1
- **Detailed Explanation:**
 - The first process that runs when Linux starts is init (or systemd in modern Linux), which gets process ID 1.
 - It is responsible for starting all other processes.

6) What does the command pwd display?

- **Answer:** a) Present working directory
- **Detailed Explanation:**
 - pwd (Print Working Directory) shows the current directory you are in.
 - Example:

bash

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pwd

Output: /home/user/Documents

Section B (2 Marks Questions) [6 × 2 = 12]

7) What is Linux? Mention any two advantages of using Linux.

- **Answer:**
 - Linux is an open-source, Unix-like operating system that is widely used for servers, desktops, and embedded systems.

- **Advantages:**

1. **Security:** Linux is more secure compared to Windows due to better permission handling.
2. **Customizability:** Users can modify Linux as per their needs since it is open-source.

8) Differentiate between absolute and relative path in Linux.

- **Answer:**

- **Absolute Path:**

- A full path starting from the root /.
- Example: /home/user/documents/file.txt

- **Relative Path:**

- A path relative to the current directory.
- Example: documents/file.txt (if currently in /home/user/).

9) What is the function of the grep command? Give an example.

- **Answer:**

- grep is used to search for text patterns within files.
- Example:

bash

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grep "error" log.txt

- Searches for the word "error" in log.txt.

10) Explain the purpose of the top command.

- **Answer:**

- top shows real-time information about running processes, CPU usage, and memory usage.
- Example:

bash

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top

- This displays active processes and resource consumption.

11) What is a shell in Linux? Name any two types of shells.

- **Answer:**
 - A shell is a command-line interface that allows users to interact with the OS.
 - **Types of Shells:**
 1. **Bash (Bourne Again Shell)**
 2. **Zsh (Z Shell)**

12) How can you change file ownership in Linux?

- **Answer:**
 - Use the chown command.
 - Example:

bash

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chown user1 file.txt

- Changes the owner of file.txt to user1.

Section C (3 Marks Questions) [3 × 3 = 9]

13) Explain any three file permissions in Linux.

- **Answer:**
 - **Read (r):** Allows reading the file.
 - **Write (w):** Allows modifying the file.
 - **Execute (x):** Allows running the file as a program.

14) What is the purpose of the ps command? Explain with an example.

- **Answer:**
 - ps lists currently running processes.
 - Example:

bash

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ps aux

- Displays all running processes.

15) Explain the difference between hard links and soft links in Linux.

- **Answer:**
 - **Hard Link:** Points to the same inode, even if the original file is deleted.
 - **Soft Link (Symlink):** A pointer to another file; it breaks if the original file is deleted.
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Section D (4 Marks Questions) [2 × 4 = 8]

16) Describe the booting process of a Linux system.

- **Answer:**
 1. **BIOS/UEFI:** Initializes hardware.
 2. **Bootloader (GRUB):** Loads the kernel.
 3. **Kernel Initialization:** Starts system processes.
 4. **Init/Systemd:** Starts services.
 5. **User Login:** Allows user interaction.

17) What is process scheduling in Linux? Explain different scheduling policies.

- **Answer:**
 - **Scheduling Policies:**
 1. **FIFO:** First in, first out.
 2. **Round Robin:** Each process gets equal CPU time.
 3. **CFS:** Linux's default scheduler for fairness.
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Section E (5 Marks Questions) [2 × 5 = 10]

19) Explain different types of file systems supported by Linux.

- **Answer:**
 1. **Ext4:** Default file system in Linux.

2. **XFS:** High-performance journaling file system.
3. **Btrfs:** Supports snapshots.
4. **FAT32:** Used for USB drives.
5. **NTFS:** Compatible with Windows.

20) Write a short note on user management commands in Linux.

- **Answer:**
 - **useradd:** Adds a new user.
 - **passwd:** Changes a user's password.
 - **usermod:** Modifies user details.
 - **groupadd:** Creates a group.
 - **id:** Shows user and group IDs.

Advance web tech

Which HTML5 element is used to define navigation links?

- **Answer:** a) <nav>
- **Explanation:** The <nav> element in HTML5 is used to define a section of navigation links.
Example:

html

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<nav>

Home

About

</nav>

2) What does the placeholder attribute do in an HTML form?

- **Answer:** b) Provides a hint inside the input field
- **Explanation:** The placeholder attribute provides a temporary hint to users about what to enter in the input field. Example:

html

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```
<input type="text" placeholder="Enter your name">
```

3) In CSS, which property is used to control the stacking order of elements?

- **Answer:** c) z-index
- **Explanation:** The z-index property controls which elements appear above others. It works with positioned elements (relative, absolute, fixed).

css

CopyEdit

```
div {  
  
    position: absolute;  
  
    z-index: 10;  
  
}
```

4) What is the default value of the position property in CSS?

- **Answer:** d) static
- **Explanation:** The static position means elements are placed in their natural order without any positioning applied.

5) Which JavaScript function is used to execute code after a specific time interval?

- **Answer:** a) setTimeout()
- **Explanation:** setTimeout() runs a function after a given time delay (in milliseconds).

javascript

CopyEdit

```
setTimeout(function() {  
  
    console.log("Hello after 3 seconds!");  
  
}, 3000);
```

```
}, 3000);
```

6) What is event delegation in JavaScript?

- **Answer:** b) Assigning an event to a parent element instead of child elements
- **Explanation:** Instead of adding event listeners to multiple child elements, we attach it to a parent and use event.target to detect which child triggered the event.

javascript

CopyEdit

```
document.getElementById("parent").addEventListener("click", function(event) {  
    console.log("Child clicked:", event.target);  
});
```

Section B (2 Marks Questions) [6 × 2 = 12]

7) What are HTML5 semantic elements? Name any two.

- **Answer:** Semantic elements give meaning to the content inside them.
- Examples: <header>, <section>, <article>, <footer>.

8) What is the difference between inline, block, and inline-block elements in CSS?

- **Answer:**
 - **Inline:** Takes only as much width as needed (e.g., , <a>).
 - **Block:** Takes full width (e.g., <div>, <p>).
 - **Inline-block:** Behaves like inline but allows height and width settings.

9) What is a media query in CSS? Give an example.

- **Answer:** Media queries allow responsive design by applying styles based on screen size.

css

CopyEdit

```
@media (max-width: 600px) {  
    body { background-color: lightblue; }  
}
```

10) Explain the difference between absolute and relative positioning in CSS.

- **Answer:**
 - **Absolute:** Positions the element relative to the nearest positioned ancestor or viewport.
 - **Relative:** Positions the element relative to its normal position.

11) What is event bubbling in JavaScript?

- **Answer:** Event bubbling means an event starts from the target element and propagates up to parent elements.

12) How can you remove an event listener in JavaScript?

- **Answer:** Use `removeEventListener()`.

javascript

CopyEdit

```
function myFunction() { console.log("Clicked!"); }

document.getElementById("btn").addEventListener("click", myFunction);

document.getElementById("btn").removeEventListener("click", myFunction);
```

Section C (3 Marks Questions) [3 × 3 = 9]

13) Explain the importance of the <meta> tag in HTML.

- **Answer:** The <meta> tag provides metadata about the webpage, such as character encoding, viewport settings, and SEO-related information.

14) What is the difference between nth-child and nth-of-type in CSS?

- **Answer:**
 - `nth-child(n)`: Targets the nth child regardless of type.
 - `nth-of-type(n)`: Targets the nth element of a specific type.

15) What is the difference between `map()` and `forEach()` methods in JavaScript?

- **Answer:**
 - `map()`: Returns a new array with transformed elements.
 - `forEach()`: Iterates over elements but does not return a new array.

Section D (4 Marks Questions) [2 × 4 = 8]

16) Explain the key differences between Sass and Less.

- **Answer:**
 - **Sass:** Uses .scss or .sass syntax, supports more features.
 - **Less:** Uses .less syntax, works with JavaScript.

17) What is the difference between local storage and session storage in JavaScript?

- **Answer:**
 - **Local Storage:** Stores data permanently until manually cleared.
 - **Session Storage:** Stores data only until the session (tab) is closed.

javascript

CopyEdit

```
localStorage.setItem("name", "John");
```

```
console.log(localStorage.getItem("name")); // Outputs: John
```

Section E (5 Marks Questions) [2 × 5 = 10]

18) Write a brief note on responsive web design and media queries.

- **Answer:** Responsive web design ensures web pages adapt to different screen sizes. It uses flexible layouts, images, and CSS media queries. Example:

css

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```
@media (max-width: 768px) {
```

```
  body { font-size: 14px; }
```

```
}
```

19) Explain the different types of JavaScript events with examples.

- **Answer:**
 - **Mouse Events:** click, mouseover, mouseout.
 - **Keyboard Events:** keydown, keyup.
 - **Form Events:** submit, focus, blur.
 - **Window Events:** resize, scroll.

Example:

javascript

CopyEdit

```
document.getElementById("btn").addEventListener("click", function() {  
    alert("Button Clicked!");  
});
```

Automata

1) A DFA stands for:

- **Answer: a) Deterministic Finite Automaton**
- **Explanation:**
A **DFA** is a finite-state machine that accepts or rejects strings based on a set of defined states and transitions, ensuring **one unique transition for each input symbol** at any given state.

2) Which of the following is true for a DFA?

- **Answer: c) DFA has only one initial state**
- **Explanation:**
A DFA must have a **single initial state** from which processing begins. Unlike NFA, it cannot have multiple starting points.

3) What is the full form of NFA?

- **Answer: c) Non-deterministic Finite Automaton**
- **Explanation:**
An **NFA** allows **multiple transitions for a single input symbol** and can include **ϵ (epsilon) transitions** that allow movement between states without consuming input.

4) Which type of grammar corresponds to regular languages?

- **Answer: a) Right and Left Linear Grammars**

- **Explanation:**
Regular languages are described by **Right Linear** and **Left Linear Grammars**, where production rules have at most one **non-terminal** on the right or left side.

5) Which of the following is a regular expression for a language consisting of strings with an even number of 0s?

- **Answer:** a) $(00)^*$
- **Explanation:**
 - $(00)^*$ ensures that every 0 appears in a pair, guaranteeing an even count of 0s.
 - Example: "" (empty string), "00", "0000", "000000", etc.

6) Which of the following can be represented using a finite automaton?

- **Answer:** c) Strings with an even number of 1s
- **Explanation:**
A **finite automaton** can count occurrences modulo 2 (even/odd) but **cannot store arbitrary large counts** like palindromes ($a^n b^n$).

Section B (2 Marks Questions) [6 × 2 = 12]

7) What is a finite automaton?

- **Answer:**
A **finite automaton (FA)** is a theoretical machine with a **finite number of states** used to recognize patterns in strings.
- **Example:**
A vending machine recognizing specific coin sequences can be modeled as an FA.

8) Define a transition function in DFA.

- **Answer:**
The **transition function $\delta(q, a)$** defines the next state of a DFA when it reads an input symbol a at state q .
- **Mathematically:**

$$\delta: Q \times \Sigma \rightarrow Q \quad \delta: Q \times \Sigma \rightarrow Q$$

where:

- Q = Set of states

- Σ = Input alphabet
- $\delta(q, a)$ = Next state after input a at q

9) What is an epsilon (ϵ) transition in NFA?

- **Answer:**
 - **Epsilon (ϵ) transitions** allow state transitions without consuming any input symbol.
 - This makes NFAs more flexible than DFAs.
- **Example:**

lua

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$q_0 \xrightarrow{\epsilon} q_1$

The automaton moves from q_0 to q_1 without reading an input symbol.

10) What is the difference between DFA and NFA?

Feature	DFA	NFA
Transition for each input symbol	Unique	Multiple possible transitions
Epsilon (ϵ) transitions	Not allowed	Allowed
Complexity	Simpler	More flexible
Construction	Harder	Easier

- **Example:**
 - DFA for $(a|b)^*$: Unique transitions per state
 - NFA for $(a|b)^*$: Multiple transitions allowed

11) What is a regular expression? Give an example.

- **Answer:**
A **regular expression (regex)** describes a **regular language** using symbols and operators.
- **Example:**

python

CopyEdit

$(a|b)^*$ → Represents all strings with a combination of 'a' and 'b'

12) Define a right-linear grammar with an example.

- **Answer:**
 - **Right-linear grammar:** The **non-terminal** appears at the **rightmost position**.
 - **Example:**

less

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$S \rightarrow aA \mid b$

$A \rightarrow aB \mid b$

$B \rightarrow a \mid \epsilon$

Section C (3 Marks Questions) [3 × 3 = 9]

13) Construct a DFA for the language $L = \{w \mid w \text{ ends with } 01\}$.

- **Answer:**
 - The DFA **tracks the last two characters read**.
 - **States:** q_0 (start), q_1 (reads 0), q_2 (reads 01).
 - **Final state:** q_2 .
 - **Transition table:**

Current State Input = 0 Input = 1

q_0 (start)	q_1	q_0
q_1	q_1	q_2
q_2 (final)	q_1	q_0

14) Explain the concept of language in automata theory.

- **Answer:**
 - A **language** is a set of strings that a finite automaton recognizes.
 - **Example:**
 - $L = \{w \mid w \text{ contains at least one 'a'}\} = \text{Strings with at least one 'a'}$
-

15) Convert the regular expression $(0+1)^*01$ into an NFA.

- **Answer:**
 - Construct an **NFA** that allows any number of 0s and 1s before **ending with 01**.
-

Section D (4 Marks Questions) $[2 \times 4 = 8]$

16) Convert the following NFA to an equivalent DFA.

- **Answer:**
 - Apply the **subset construction method** to convert the NFA into a DFA.
-

17) Define left-linear and right-linear grammars with examples.

- **Answer:**
 - **Left-linear grammar:** Non-terminal appears on the **left**.

less

CopyEdit

$A \rightarrow Aa \mid b$

- **Right-linear grammar:** Non-terminal appears on the **right**.

less

CopyEdit

$S \rightarrow aA \mid b$

Section E (5 Marks Questions) $[2 \times 5 = 10]$

18) Prove that DFA and NFA are equivalent.

- **Answer:**
 - Every **NFA can be converted into an equivalent DFA** using the **subset construction method**.
 - Since both **recognize the same set of regular languages**, they are **equivalent**.
-

19) Convert the regular expression $(0+1)00(0+1)$ into a DFA.

- **Answer:**
 - The DFA should ensure that the last **two symbols are 00**, surrounded by any number of 0s and 1s.
-