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Class: TE IT B Academic Year: 2023-2024

Experiment – 11
To build a simple Web Server using Node.js.

Aim: To build a simple Web Server using Node.js.

Objective: After performing the experiment, the students will be able to build a simple Web Server using Node.js using HTTP module.

Lab objective mapped: Students will be able to create back-end applications using Node.js/ Express (PO3, PO5, PSO3, PSO4)

Prerequisite: Node.js

Requirements: The following are the requirements –
- PC/Laptop
- Visual Studio Code
- Browser

Theory:

A. Node.js is an open-source server environment. Node.js allows you to run JavaScript on the server. A common task for a web server can be to open a file on the server and return the content to the client. Node.js handles a file request in the following manner:
- Sends the task to the computer's file system.
- Ready to handle the next request.
- When the file system has opened and read the file, the server returns the content to the client.

Node.js eliminates the waiting, and simply continues with the next request. Node.js runs single-threaded, non-blocking, asynchronously programming, which is very memory efficient.
Node.js can generate dynamic page content. It can create, open, read, write, delete, and close files on the server. It can collect form data, add, delete and modify data in your database,
Node.js files contain tasks that will be executed on certain events. A typical event is someone trying to access a port on the server. Node.js files must be initiated on the server before having any effect Node.js has a set of built-in modules which you can use without any further installation. To include a module, use the *require()* function with the name of the module: You can create your own modules, and easily include them in your applications.

B. Node.js as a Web Server

The HTTP module can create an HTTP server that listens to server ports and gives a response back to the client. Use the *createServer()* method to create an HTTP server:

```
var http = require('http');
//create a server object
```

```
http.createServer(
function (req, res) {
  res.write('Hello World!'); //write a response to the client
  res.end("Hello ");} //end the response
  }).listen(8080); //the server object listens on port 8080
```

The function passed into the *http.createServer()* method, will be executed when someone tries to access the computer on port 8080.

File handling using Node.js

The Node.js file system module allows you to work with the file system on your computer. To include the File System module, use the *require()* method.

The ***fs*** module provides an API for interacting with the file system of your operating system. We can use this module, in code like this:

```
const fs = require('fs');
```

Using this node module, we can perform various tasks such as opening files, writing data into a file,

reading data from files, etc.

You can use ***fs.readFile()*** method to read files in Node. For example:

```
const fs = require('fs');
fs.readFile('./lorem.txt', (err, data) => {
if(err) {
 return console.log('Error occurred while reading file');
 }
 console.log(data.toString());
});
```

If you just want to check the file existence in the system, use the ***access()*** function. *const fs = require('fs');*

```
const path = './config.js';
fs.access(path, fs.F_OK, (err) => {
if (err) {
 console.error(err);
 return;
 }
});
```

The file system module provides three methods to create files:

1. fs.open()
2. fs.writeFile()
3. fs.appendFile()

fs.open() method opens a new file or creates a new empty file if it does not exist in the specified path. It takes the second parameter which acts as a flag such as w for writing, w+ for reading and writing, etc.

fs.writeFile() method allows you to create or replace files with the content. If a file exists, it will replace the content with the provided content and if the file does not exist, it will create it.

```
 const fs = require('fs');
fs.open('file.txt', 'w', (err, file) => {
if (err) {
  throw err;
 }
  console.log('Saved!');
});
```

fs.appendFile() method appends the provided content at the end of the file.

```
 const fs = require('fs');
fs.appendFile('file.txt', ' Hello World', (err) => {
  if (err) {
  throw err;
  }
  console.log('Updated!');
});
```

To delete a file, we can use ***fs.unlink()*** method.

```
 const fs = require('fs');
fs.unlink('file.txt', (err) => {
if (err) {
  throw err;
 }
  console.log('File deleted!');
});
```

To rename a file, we can use the ***fs.rename()*** method.

```
 const fs = require('fs');
fs.rename('newfile.txt', 'oldfile.txt', (err) => {
if (err) {
  throw err;
 }
  console.log('File Renamed!');
});
```

You can also copy files using the ***fs.copy()*** method.

```
const fs = require('fs');
fs.copyFile(file.txt', 'copyfile.txt', (err) => {
 if (err) {
 throw err;
 }
 console.log('File is copied!');
});
```

You can write a switch case in node.js to choose to perform any one operation using the code *const prompt = require('prompt-sync')({sigint: true});*

```
var ch=parseInt(prompt("enter"));
switch(ch)
{
case 1:access1(); break;
case 2:open(); break;
case 3:appendfile(); break;
case 4: read(); break;
}
```

Laboratory Exercise:

A. Procedure

1. Create a Web Server

- Install node.js (npm installs automatically)
- Open terminal window (use cmd command)
- Check version of node.js (node -v) and version of npm (npm -v) ● Open vs-code and open the folder.
- Write the node.js code. Save the file with .js extension.
- Initiate the file using the command node <filename>

View the Output on browser window by accessing the local host on the port number used in the code. (eg. http://localhost:8080)

2. File Operations using Node.js

- Install node.js (npm installs automatically)
- Open terminal window (use cmd command)
- Check version of node.js (node -v)
- Check version of npm (npm -v)
- Install prompt-sync from terminal using following commands - ● npm install prompt-sync
- Open vs-code and open the folder.
- Create a text file.
- Write the node.js code

View the Output on terminal window by running the command *node <filename>*

B. Program Code

1) Write a code to build a simple web server using Node.js that returns a message when the user requests the server. Use HTTP module to achieve web server functionality.

2) Write a code to perform the following File Handling operations using Node.js as per the chosen operation (use switch case for choosing the operation)

- Read
- Access

- Open
- Write
- Append

Post Experimental Exercise

1. Differentiate between net and http module?
2. What is a web server? Draw and explain Web Application Architecture.

Results/Observations/Program output:

Present the program code and output

CODE:

```
const fs = require('fs');
const prompt = require('prompt-sync')({ sigint: true });

function asynchronousRead() {
    fs.readFile('file.txt', function (error, data) {
        if (error) {
            return console.error(error);
        }
        console.log("Asynchronous read: " + data.toString());
    });
}

function synchronousRead() {
    try {
        var data = fs.readFileSync('file.txt');
        console.log("Synchronous read: " + data.toString());
    } catch (error) {
        console.error(error);
    }
}

function openFile() {
    console.log("Opening the file");
    fs.open('file.txt', 'r+', function (err, fd) {
        if (err) {
            return console.error(err);
        }
        console.log("File Opened Successfully");
    });
}

function writeFile() {
    fs.writeFile('file.txt', 'Hello World!', function (err) {
        if (err) {
            console.log(err);
        } else {
            console.log('Write operation complete.');
        }
    });
}

function appendToFile() {
    var data = "\nLearn Node.js with the help of a well-built Node.js Tutorial.";

    fs.appendFile('file.txt', data, 'utf8', function (err) {
        if (err) throw err;
        console.log("Data is appended to file successfully.");
    });
}

function renameFile() {
    const oldFileName = prompt("Enter the name of the old file: ");
    const newFileName = prompt("Enter the name of the new file: ");

    fs.rename(oldFileName, newFileName, (err) => {
        if (err) {
            console.error("Error renaming the file:", err);
        } else {
            console.log('File Renamed!');
        }
    });
}

function copyFile() {
    const sourceFile = prompt("Enter the name of the source file: ");
    const destinationFile = prompt("Enter the name of the destination file: ");

    fs.copyFile(sourceFile, destinationFile, (err) => {
        if (err) {
            console.error("Error copying the file:", err);
        } else {
            console.log('File is copied!');
        }
    });
}

function deleteFile() {
    const fileName = prompt("Enter the name of the file to delete: ");

    fs.unlink(fileName, (err) => {
        if (err) {
            console.error("Error deleting the file:", err);
        } else {
            console.log('File deleted!');
        }
    });
}

console.log("Choose a file operation:");
console.log("1. Asynchronous Read from 'text.txt'");
console.log("2. Synchronous Read from 'text.txt'");
console.log("3. Open 'text.txt'");
console.log("4. Write to 'file.txt'");
console.log("5. Append to 'file.txt'");
console.log("6. Rename a file");
console.log("7. Copy a file");
console.log("8. Delete a file");

var choice = parseInt(prompt("Enter your choice: "));

switch (choice) {
    case 1:
        asynchronousRead();
        break;
    case 2:
        synchronousRead();
        break;
    case 3:
        openFile();
        break;
    case 4:
        writeFile();
        break;
    case 5:
        appendToFile();
        break;
    case 6:
        renameFile();
        break;
    case 7:
        copyFile();
        break;
    case 8:
        deleteFile();
        break;
    default:
        console.log("Invalid choice. Please select a valid option.");
```

```
}

console.log("Program Ended");
```

OUTPUTS:

1) Write a code to build a simple web server using Node.js that returns a message when the user
2) requests the server. Use HTTP module to achieve web server functionality.

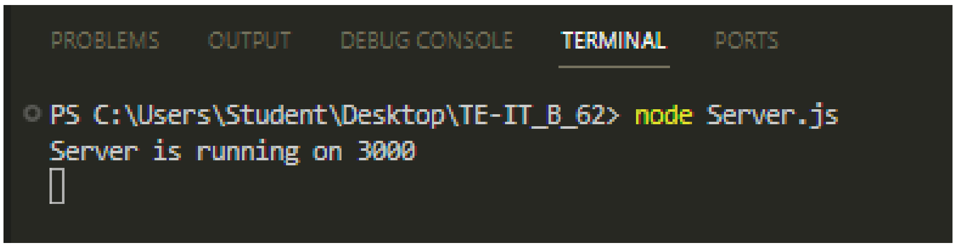
CODE:

```
const http = require("http")

const server = http.createServer((request, response) => {
   response.write("This is the response from the server");
   response.end()
})+
server.listen((3000), () => {
   console.log("Server is running on 3000");
})
```

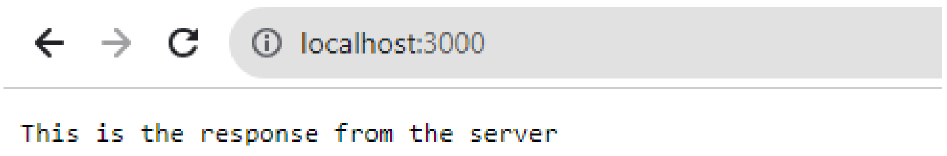
OUTPUT:

TERMINAL:



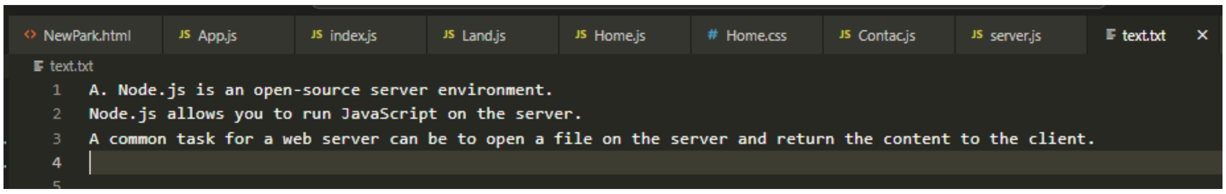
```
PS C:\Users\Student\Desktop\TE-IT_B_62> node Server.js
Server is running on 3000
```

BROWSER:



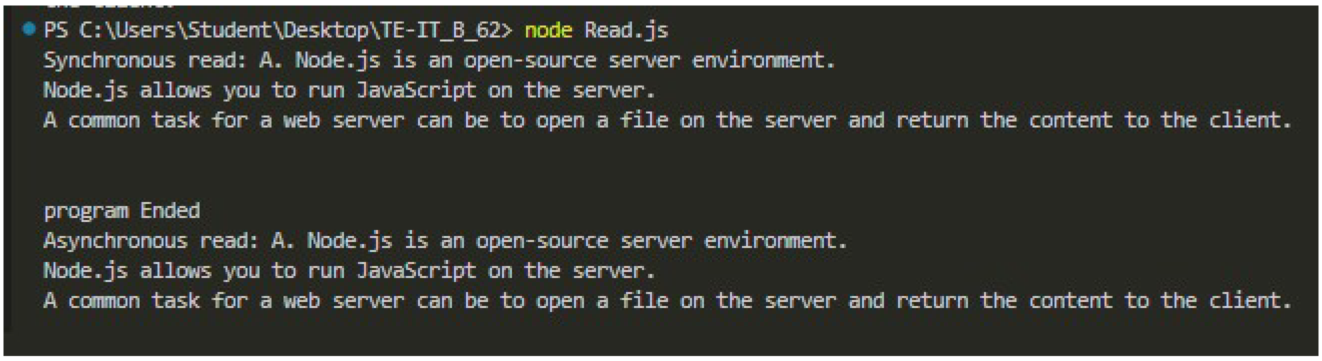
```
This is the response from the server
```

2) Write a code to perform the following File Handling operations using Node.js as perthe chosen operation (use switch case for choosing the operation)



```
A. Node.js is an open-source server environment.
Node.js allows you to run JavaScript on the server.
A common task for a web server can be to open a file on the server and return the content to the client.
```

- Read

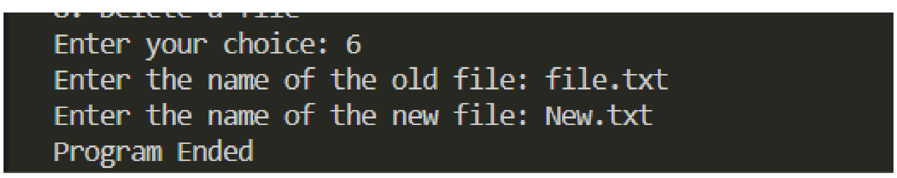


```
PS C:\Users\Student\Desktop\TE-IT_B_62> node Read.js
Synchronous read: A. Node.js is an open-source server environment.
Node.js allows you to run JavaScript on the server.
A common task for a web server can be to open a file on the server and return the content to the client.


program Ended
Asynchronous read: A. Node.js is an open-source server environment.
Node.js allows you to run JavaScript on the server.
A common task for a web server can be to open a file on the server and return the content to the client.
```

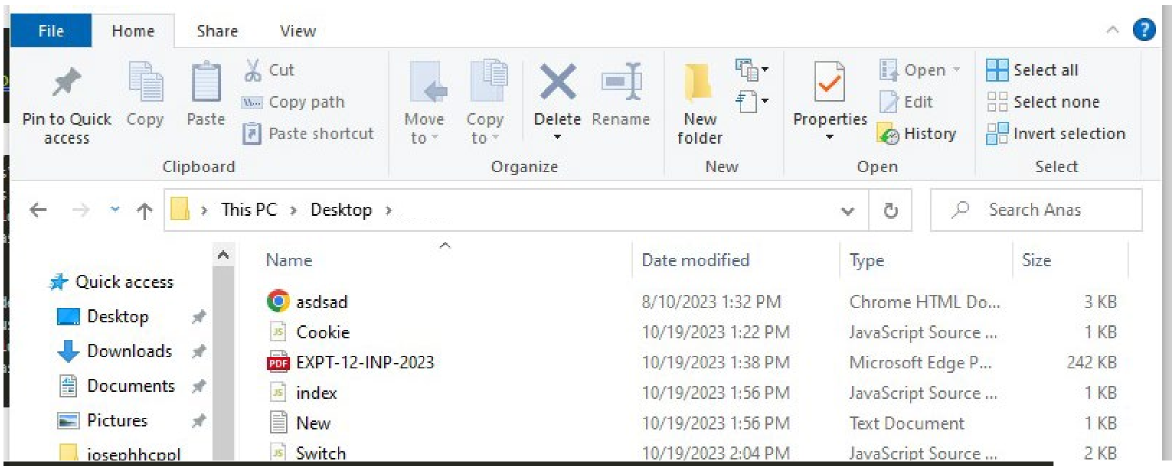
- Access

Rename File:

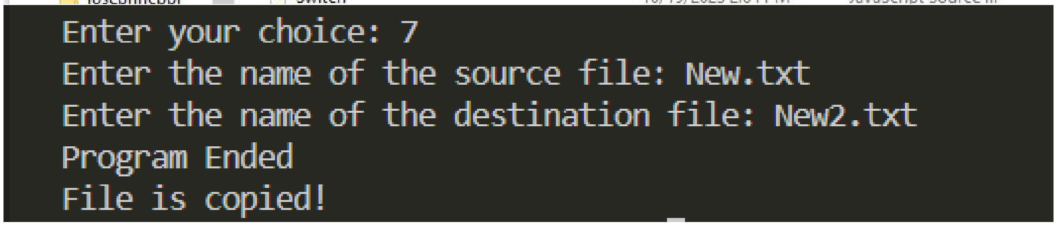


```
Enter your choice: 6
Enter the name of the old file: file.txt
Enter the name of the new file: New.txt
Program Ended
```

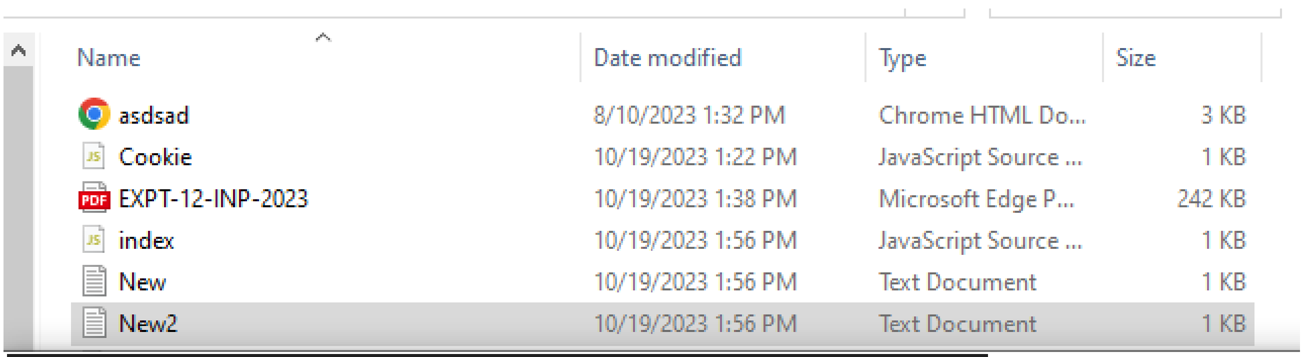
Copy File:



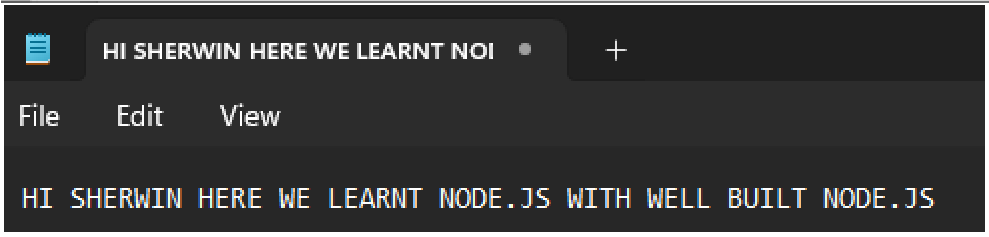
```
Name                Date modified        Type                      Size
asdsad              8/10/2023 1:32 PM    Chrome HTML Do...         3 KB
Cookie              10/19/2023 1:22 PM   JavaScript Source ...     1 KB
EXPT-12-INP-2023    10/19/2023 1:38 PM   Microsoft Edge P...     242 KB
index               10/19/2023 1:56 PM   JavaScript Source ...     1 KB
New                 10/19/2023 1:56 PM   Text Document             1 KB
Switch              10/19/2023 2:04 PM   JavaScript Source ...     2 KB
```



```
Enter your choice: 7
Enter the name of the source file: New.txt
Enter the name of the destination file: New2.txt
Program Ended
File is copied!
```

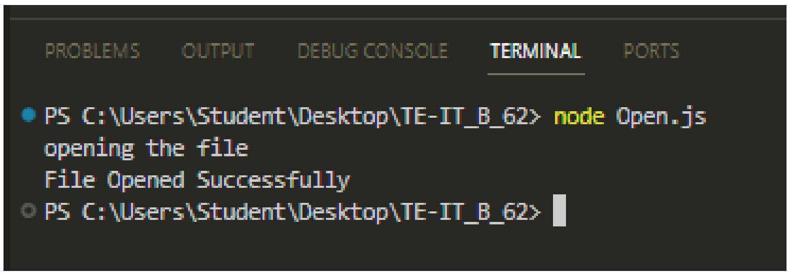


Name	Date modified	Type	Size
asdsad	8/10/2023 1:32 PM	Chrome HTML Do...	3 KB
Cookie	10/19/2023 1:22 PM	JavaScript Source ...	1 KB
EXPT-12-INP-2023	10/19/2023 1:38 PM	Microsoft Edge P...	242 KB
index	10/19/2023 1:56 PM	JavaScript Source ...	1 KB
New	10/19/2023 1:56 PM	Text Document	1 KB
New2	10/19/2023 1:56 PM	Text Document	1 KB



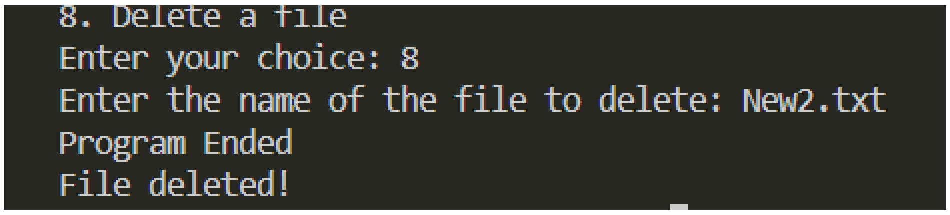
```
HI SHERWIN HERE WE LEARNT NODE.JS WITH WELL BUILT NODE.JS
```

- Open

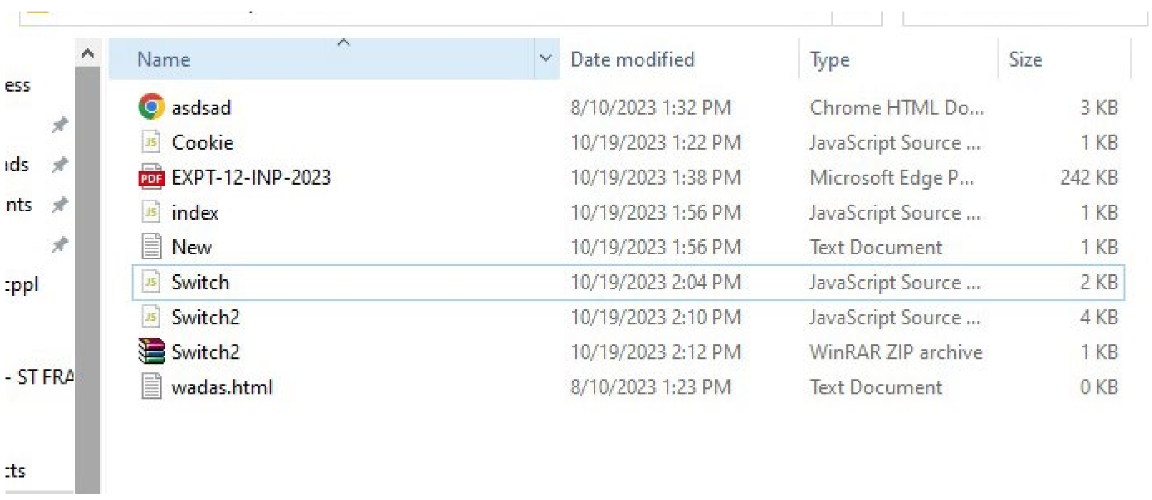


```
PS C:\Users\Student\Desktop\TE-IT_B_62> node Open.js
opening the file
File Opened Successfully
PS C:\Users\Student\Desktop\TE-IT_B_62>
```

Delete a File:

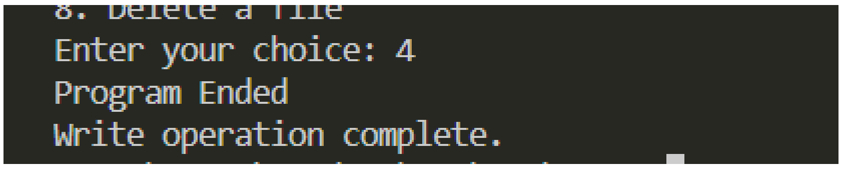


```
8. Delete a file
Enter your choice: 8
Enter the name of the file to delete: New2.txt
Program Ended
File deleted!
```

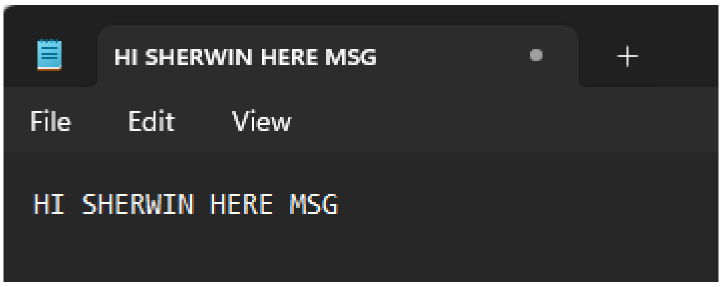


Name	Date modified	Type	Size
asdsad	8/10/2023 1:32 PM	Chrome HTML Do...	3 KB
Cookie	10/19/2023 1:22 PM	JavaScript Source ...	1 KB
EXPT-12-INP-2023	10/19/2023 1:38 PM	Microsoft Edge P...	242 KB
index	10/19/2023 1:56 PM	JavaScript Source ...	1 KB
New	10/19/2023 1:56 PM	Text Document	1 KB
Switch	10/19/2023 2:04 PM	JavaScript Source ...	2 KB
Switch2	10/19/2023 2:10 PM	JavaScript Source ...	4 KB
Switch2	10/19/2023 2:12 PM	WinRAR ZIP archive	1 KB
wadas.html	8/10/2023 1:23 PM	Text Document	0 KB

- Write

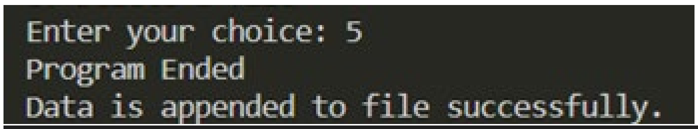


```
8. Delete a file
Enter your choice: 4
Program Ended
Write operation complete.
```

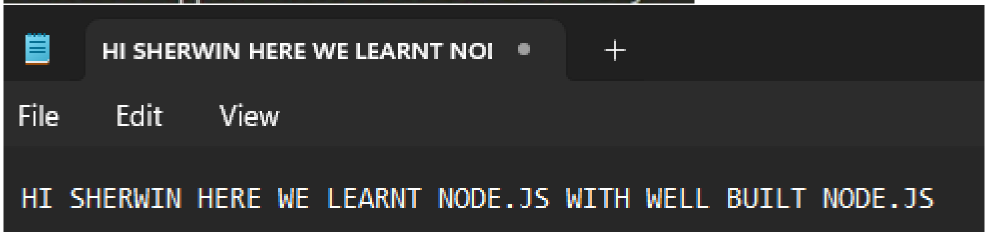


```
HI SHERWIN HERE MSG
```

- Append



```
Enter your choice: 5
Program Ended
Data is appended to file successfully.
```



```
HI SHERWIN HERE WE LEARNT NODE.JS WITH WELL BUILT NODE.JS
```

Conclusion:

Write what was performed in the experiment.

References:

- https://nodejs.org/en/
- https://www.w3schools.com/nodejs/default.asp
- https://www.tutorialsteacher.com/nodejs/create-nodejs-web-server
- https://www.youtube.com/watch?v=lm86czWdrk0
- https://codeforgeek.com/node-js-tutorial-step-by-step/