

WEB DEVELOPMENT WITH NODE AND EXPRESS (CSEN 4239)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Say you have defined a function outFn(x), that takes a single argument x, and returns a new function inFun(y) which takes a single argument y, and returns the multiplication of x and y. The inFun is defined inside the outFun. What will be the value of result after executing the following statement?
const result = outFn(5)(8);
(a) 0 (b) 5
(c) undefined (d) 40
- (ii) Following will logs undefined in console. What is the reason for it?
const doNothing = () => {};
console.log(doNothing());
(a) doNothing is a variable but used as a function (b) doNothing is a void function
(c) doNothing not returning any value (d) None of the above options
- (iii) var arr = ["B", "a", "c", "k"];
How to pick only "B" and "k" from arr using destructuring?
(a) var [first, ...fourth] = arr; (b) var [first, , fourth] = arr;
(c) var ...fourth = arr; (d) None of the above
- (iv) Which task(s) cannot be performed by a Middleware function?
(a) Execute any code. (b) Make changes to the request and the response objects.
(c) Call the next middleware in the stack. (d) Always end the request-response cycle.
- (v) What is the output of following code snippet?
process.on('exit', code => {
 setTimeout(() => { console.log('I am exiting'); }, 0);
 console.log('Exited with status code:', code);
});
console.log('Execution Completed');
(a) Execution Completed (b) Execution Completed Exited with status code: 0
(c) I am exiting (d) I am exiting Execution Completed
- (vi) What are the EJS tags used for following purposes?
1. For evaluating an expression, but not add the return value to the document
2. For including another html document
(a) <% %> , <%- %> (b) <% %> , <% =%>
(c) <% =%> , <%- %> (d) <% =%> , <% %>
- (vii) What are the Advantages of Template engine in Node.js ?
(a) Improves readability and maintainability. (b) Faster performance.
(c) Maximizes client side processing. (d) All of the above options.
- (viii) What is the function of controller in MVC pattern?
(a) Process the user request and generate response
(b) Validate user request
(c) Take request object, pull out data from request, validate, then send to service(s)
(d) None of them
- (ix) You can connect to mysql database using mysql driver either using mysql.createConnection() or mysql.createPool() method. Which are the following statements are valid when you use mysql.CretePool method?
(a) Connection will last until you close it OR connection closed by MySQL.
(b) You will receive a connection that is not currently being used, or a new connection.
(c) A single connection is blocking while executing one query, it cannot execute others.
(d) While one connection is busy running a query, others can be used to execute subsequent queries.

- (x) Which functions in net module of Node.js are used from creating TCP server and client?
 (a) net.CreateConnection(), net.createServer() (b) net.createServer() , net.CreateConnection()
 (c) net.createServer(), net.createClient() (d) net.tcpServer(), net.tcpClient()

Fill in the blanks with the correct word

- (xi) Node.js uses an event-driven, non-blocking I/O model that makes it _____ and _____.
- (xii) When a client sends request for an endpoint using HTTP request (GET, POST, PUT, DELETE) _____ determine how the server will response and it is a part of the _____ in MVC.
- (xiii) JavaScript operators _____ and _____ help you to check abstract equality and equality without doing type conversion.
- (xiv) Then _____ module provides an asynchronous network wrapper over operating system level _____.
- (xv) The _____ function of net module creates a TCP server that listens for incoming connections on a specified port and IP address.

Group - B

2. (a) What's the difference between Spread operator and Rest operator? Explain their use with examples. What is destructuring in JavaScript ES6? Say you have defined following object:

```
const task = {
  id : "TSK001", name : "Tiling and Flooring",
  dates : {
    startDate : 1644551200000,
    endDate : 1644969599000,
  }
  status : "Completed"
  tags : [ "Tower A", "First Floor", ["Tiling", "Flooring"] ]
};
```

How can you get dates and tags properties in individual variables by performing nested destructuring on object and array? [[CO1](Understand/LOCQ)]

- (b) Explain the purpose of the module.exports and require() in Node.js with an example. What is the difference between exports and module.exports? What will happen if you write two module.exports in a file? How can you define a local module consists of more than one .js files in a folder and import it to other module ? Say you have written following code in a file app.js and run it in Node. What will be the output?

```
module.exports = {name: 'Heritage'};
exports.institute = 'Kolkata';
console.log(exports === module.exports); console.log(module);
```

[[CO2](Analyze/LOCQ)]

(2 + 2) + (2 + 2 + 2 + 2) = 12

3. (a) What is scope in JavaScript? Name four types of scope in Modern JavaScript. Define Lexical Scope. What is the output printed in the console and why?

```
var noBr = 4;
function tree() {
  noBr = 8; branch();
}
function branch() { var noBr = 6; }
tree();
console.log(noBr);
```

[[CO2](Remember/LOCQ)]

- (b) Say you have stored three questions in an array. These questions will be asked one by one and after receiving answer from user the answer will be stored in another array. After exiting the process you write all the answers stored in the array. Write a code snippet using process module of Node.js to satisfy above use case. [[CO3](Understand /IOCQ)]

- (c) What are the names of two core modules which are managing module dependency? What are the steps followed to process the require function for loading a file?

Say you have created following module Student.js

```
module.exports = function (stdName, rollNo) {
  this.stdName = rollNo; this.rollNo = rollNo;
  this.stdInfo = function () { return this.stdName + ' ' + this.rollNo; }
}
```

Write a code snippet in app.js file to display your name and roll number using stdInfo() function defined in above module. [[CO3](Understand /LOCQ)]

(2 + 1 + 1) + 4 + (1 + 1 + 2) = 12

Group - C

4. (a) Following table gives the request response specification of a web application. You have to define the routes using Router module of express in a separate file exprouter.js and use it to create web server. You must display server date in console for every request and after starting the server display "Node server is running" in console.

Request url	Response
-------------	----------

localhost:3000/rt/ Heritage Home Page
 localhost:3000/rt/about About Us
 localhost:3000/rt/student/rollNo If rollNo = 0 display Not a Student Page Otherwise display Student Page
 localhost:3000/rt/user/1 Invalid Request

[[CO4](Analyse/IOCQ)]

- (b) What is middleware? How request and response objects are available in middleware functions? What is the function of body-parser middleware? How can you use it to extract URL encoded data submitted through Post request?

[[CO4](Remember/LOCQ)]

- (c) Following route handler in express will generate an error which will be display in browser as “Internal Server Error”. Who is responsible for generating that error response?

```
router.get("/bad", (req, res) => {
  const a = 1;
  res.send(a + b); //this will cause a ReferenceError because 'b' is not defined!
})
```

Following route handler will throw an error and your application crashes and exits. What is the reason behind it. How can you handle this error gracefully?

```
app.get('/myroute', async (req, res) => {
  throw new Error('My error!');
});
```

[[CO4](Apply/IOCQ)]

$$6 + (1 + 1 + 1 + 1) + 2 = 12$$

5. (a) What is an EventEmitter in Node.js?

[[CO3](Understand/LOCQ)]

- (b) Write a short code snippet to explain the features of EventEmitter?

[[CO3](Understand/LOCQ)]

- (c) You have to create an ActivityGr table in MySql database name ActivityDB. Assume that admin credential for MySQL is user: "root", password: "hit" and host : "localhost". Create code snippets in Node to perform following functions :

- Create database named ActivityDB
- Create ActivityGr table in the above database with the fields grId INT(2), grDescription VARCHAR(255), pointEarned INT(3) and maxPoint INT(3)
- Show all record stored in the table
- Writ the command to execute above code snippets in node environment assuming that snippets are stored in separate .js file.

[[CO6](Understand/IOCQ)]

$$2 + 2 + (2 + 2 + 2 + 2) = 12$$

Group - D

6. (a) What is Validation and sanitization? Why do you need server-side validation?

[[CO4](Understand/LOCQ)]

- (b) What is express-validator and write down its features? Explain the syntax and function of check() method of express-validator.

[[CO4](Understand/LOCQ)]

- (c) Say you are posting a form in an express application which contains your name, email and password. Write a code snippet to validate these three fields as per following validation criteria using express-validator.

- Name field must contain only alpha and length minimum 5 character
- Must be valid email
- Password must be minimum 8 character and maximum 15 character

For each validation you have to show appropriate custom error message.

[[CO5](Analyse/LOCQ)]

$$(2 + 2) + (1.5 + 1.5) + 5 = 12$$

7. (a) What is cookie and it's usage in browser environment?

Explain how cookies work with an example. Write names of different types of cookies.

What is the main difference between a session and a cookie?

Write a code snippet to set a cookie userId = '0x1234' in your Express application using suitable middleware.

[[CO4](Remember/LOCQ)]

- (b) Write a middleware to display the timestamp of your request received at server in the final response sent to browser against each request. Use this middleware to send a response “Hello user your request is received at XXXX” where XXXX is the timestamp of your request against a get request with url “/user” in your express application.

[[CO5](Analyse/IOCQ)]

$$(2 + 3 + 1 + 1 + 2) + 3 = 12$$

Group - E

8. Develop an Express application using MVC pattern to perform CRUD operation in a MySQL table using default Mysql driver provided by Node.js. Assume that the Item table already exists in the MySQL database having fields itemCode, description, stockinHand and UOM. You must use following guidelines:

- Write codes for model, controller and routes in separate files
- Write two model method updateOne for updating an item using itemCode as key and getAllItem to get all item information.
- Create the Controller with two methods for invoking above model methods.
- Define two routes for two controller methods using Router module of Express.
- Develop server.js for invoking server application using the routes already developed.
- Assume that MySQL credential already available in config.js file and you have to use it while creating connection object.

How can you run this application in node? Briefly describe the testing approach.

[[CO5,CO6](Analyse/HOCQ)]

9. (a) What is socket? Which node.js module provides an asynchronous network wrapper over operating system level sockets? Specify some use of this module. What is the purpose of createServer() and createConnection() functions provided in this module? [[CO6)(Apply/HOCQ]]
- (b) Write a TCP server program which will serve multiple clients. After receiving data from a client it will echo it to all other clients. When a client terminates its connection server will notify it to all other clients that this client is disconnected. Write a simple TCP client to test this functionality. [[CO6)(Apply/HOCQ]]
- 5 + 7 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	51.04	23.96	25.00