

**WEB DEVELOPMENT WITH NODE AND EXPRESS
(CSEN 4237)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

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

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (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) console.log(hoist); // Output: undefined
var hoist = 'The variable has been hoisted.';
Above code snippet will log “undefined”. What change will you suggest to show “ReferenceError: hoist is not defined” instead of “undefined”?
(a) Add one line 'use strict'; at the top (b) Change var of the 2nd line to let
(c) Both (a) & (b) (d) Not possible to change the error.
- (iii) Given the following classes and prototype relationships:
class Person {}
class Employee extends person {}
class Developer extends Employee {}
const dev1 = new Developer();
What will be the value of each line in the snippet below?
Object.getPrototypeOf(tom) === Developer.prototype;
Object.getPrototypeOf(tom) === Employee.prototype;
(a) true, false (b) true, true (c) false, false (d) false, true.
- (iv) Why does it return false when comparing two similar objects in JavaScript?
leta={a:1}; letb={a:1};
console.log(a===b); // logs false even though they have the same property
(a) (a) and (b) are two different objects
(b) When objects are compared it is compared by reference
(c) Objects comparison is not possible
(d) None of above.
- (v) What is the equivalent arrow function for following function?
function multiNum(x) {
 return function(y) {
 return x*y;
 };
}
(a) Not possible to represent in arrow function
(b) const multiNum = (x) => (y) => x*y;
(c) const multiNum = (x,y) => x*y;
(d) const multiNum = (x,y) => { var z=0; z= x*y; return z; }.
- (vi) What will be the return value if you use the expression '2,5,7' == [2,5,7] and '2,5,7' === [2,5,7] ?
(a) true, false (b) true, true (c) false, true (d) false, false.
- (vii) What are the packages mostly used in Node environment for generating and sending clean, responsive HTML e-mails?
(a) nodemailer and doc (b) nodemailer and htmlgen
(c) nodemailer and mailgen (d) nodemailer and mailgen.

- (viii) 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) All of the above.
- (ix) Why the output of line 6 and 8 showing same value for val although you emit the event before displaying the value?
var events = require('events'); var EventEmitter = new events.EventEmitter();
let val = 0; var incrementValue = () => { val+=1; }
eventEmitter.once('CustomEvent', incrementValue);
eventEmitter.emit('CustomEvent');
console.log(val); // Line - 6
eventEmitter.emit('CustomEvent');
console.log(val); // Line - 8
(a) Event is listen only once (b) Emitting any event repeatedly causes this
(c) eventEmitter does not support any once() method (d) None of above options.
- (x) Which one is used for inserting application level middleware in Express application pipeline?
(a) app.use (b) router.use (c) both (a) & (b) (d) none of them.

Group – B

2. (a) What is Hoisting in JavaScript?
Create an animal object with leg and ear properties and bark() and jump() methods using object initialization and Object.create function syntax.
Suppose you have following code snippet in the global scope:
console.log(rollNo); // 1
rollNo = 1004;
console.log(rollNo); // 2
console.log(greet("Prakash")); // 3
function greet(name){ return 'Hello ' + name + '!'; }
varrollNo;
What will be the output of the lines 1,2 and 3? Justify your answer. [[CO1](Remember/LOCQ)]
- (b) What is the difference between the classical and the prototypical inheritance?
The following code won't print the person's name? Can you explain why? And how can we fix it?
function Person(name) {this.name = name;}
Person.prototype.getName = () => {
return this.name;
};
const tom = new Person('Tom');
console.log(tom.getName()); [[CO1](Understand/IOCQ)]
- (c) What is async/await and explain how does it work with an example? [[CO1](Remember/LOCQ)]
(1 + 2 + 1) + (3 + 2) + 3 = 12
3. (a) In a normal login scenario you need to call the login function with in_email and in_Password as parameters. This function will get the user from database by calling an asynchronous function getUser(in_email) which will return the user object. Next check the validity of password by calling another asynchronous function checkPassword(in_password, usrPassword) which will return true if password matches. If matched then call another asynchronous function genJWT(in_password) to generate JWT token. Implement this login function using async/await syntax with appropriate errors handling. [[CO1](Analyze/IOCQ)]
- (b) What is the function of resolve and reject in promise? Who is providing these two arguments? What is the initial state and result of a promise? How the state of promise changed to fulfilled and rejected? What are the methods used to registered / subscribed the consuming function in promise? [[CO1](Understand/LOCQ)]
- (c) “Imagine you are a **kid**. Your mom **promises** you that she'll get you a **new phone** next week.” You *don't know* if you will get that phone until next week. Your mom can *really buy* you a brand new phone, or *she doesn't*. That is a **promise**. A promise has three states. They are:
• Pending: You *don't know* if you will get that phone
• Fulfilled: Mom is *happy*, she buys you a brand new phone
• Rejected: Mom is *unhappy*, she doesn't buy you a phone
Write code snippet for creating above promise and consuming that promise. [[CO1](Analyze/HOCQ)]
2 + (2 + 1 + 1 + 1 + 1) + 4 = 12

Group – C

4. (a) 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)]
- (b) Consider following middlewares stack in an express application:
app.use(function(req, res, next){
console.log('processing request for "' + req.url + '"....');
});

```

    next();
  });
  app.use(function(req, res, next){
    console.log('terminating request');
    res.send('thanks for playing!');
  });
  app.use(function(req, res, next){
    console.log('whoops, i\'ll never get called!');
  });

```

What is the function of 2nd middleware? If you omitted the res.send what will happen? Why last middleware is not executed at all?

[[CO5](Analyze/LOCQ)]

- (c) Explain briefly the function of error handling middleware with an example.

Following route handler in express will generate an error which will be display in browser as “InternalServer 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 through 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!');
});

```

[[CO3](Analyze/IOCQ)]

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

5. (a) Explain the process model of Node.js and how is it differ from traditional web server model.

Write at least four advantage of Node.js.

What are the two main dependencies of Node.js? What is the main function of Libuv library in NodeJs? How many additional threads are provided by this library by default?

[[CO4](Remember/LOCQ)]

- (b) Write a code snippet for creating web server using http module of Node.js and showing response heritage/cse against request url localhost:3000/heritage/cse.

What is the purpose of process module in Node JS? Why the process object is always available to Node.js application without using require()?

What is the output of following code snippet? What is the value of code and what does it indicate?

```

process.on('exit', code => {
  setTimeout(() => { console.log('Will not get displayed'); }, 0);
  console.log('Exited with status code:', code);
});
console.log('Execution Completed');

```

[[CO3](Understand/LOCQ)]

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

Group – D

6. (a) Define validation and sanitization. Give three names of standard validator and sanitizer available in express-validator. What is the function of validationResult() in express-validator? What is format of each error returned by by .array() and .mapped() methods?

[[CO5](Remember/LOCQ)]

- (b) Say you have received name, email and password in a route of an Express application. Write a code snippet to apply following validation rules to those fields using express-validator. You must provide appropriate custom error message for each validator.

For name field : minimum 3 character, must not empty, contain no spaces at the beginning or end, replace <, >, &, ', " and / with HTML entities.

For email field : must be valid email and sanitize using normalizeEmail()

For password field : length > 8 <=15, should be at least one number, must contain one special character

If validation fails send a response with status code 422 with error messages other call next middleware function.

[[CO5](Analyze/IOCQ)]

(2 + 2 + 1 + 2) + 5 = 12

7. (a) What is template? What is the function of template engine in Node.js? Give name of at least three template engines for Node.js.

How to use EJS in Express application?

[[CO4](Understand/LOCQ)]

- (b) What is partial in EJS?

Say three partials title.ejs, header.ejs and footer.ejs are supplied in /views/partial folder in application root folder. Develop an EJS template **student.ejs** in views folder which will show a list of student name. You must add these three partials in appropriate place in student.ejs. Now develop a simple express application which will send an array of student [{ name: "Amar Pal", roolNo: "967431" }, { name: "Susil Singh", rollNo: "9768678"}] which will be displayed in student.ejs template.

[[CO4](Analyze/IOCQ)]

(1 + 1 + 2 + 2) + (1 + 5) = 12

Group - E

8.

(a)

What is the purpose of the Nodemailer and Mailgen packages?
Describe briefly the steps to be followed for sending emails using nodemailer API?
Write code snippet for setting theme and product info for mailgen? Where the product info appears in an email?
[[CO5](Understand/IOCQ)]

(b)

Assume mail body is already available in a variable name response. Now generate the HTML mail body using mailgen and send that mail using nodeMailer package assuming the route as “/sendMail”.
[[CO6](Analysis/IOCQ)]

(c)

What is Multer? What is the purpose of Multer storage engine?
[[CO5](Remember/LOCQ)]

(2 + 1 + 2) + 4 + 3 = 12
9.

(a)

Create an email body using mailgen module which must contain following lines :
 - Dear xxxxx , where xxxxx is the name accessed from cookie
 - Introduction line: “Welcome to our site. We are offering discount for following item.”
 - Add a table with three column for item detail and discount like name: Lenovo Thinkpad, price : Rs. 4500/-, discount : 25%
 - An action button “Reply” with a link ‘https://mailgen/...’ and instruction “Please reply to get the discount”
 - Add one section containing “Need help ... contact us”Now generate an HTML email with the above content and write in an html file for review purpose.
[[CO5](Analyse/HOCQ)]

(b)

Now send the generated mail body using nodeMailer package assuming the route as “/sendMail”. If the mail is sent successfully send a response with status 200 with a message “you should receive an email from us” and in case of error display the error in console.
[[CO6](Analyse/IOCQ)]

(c)

Give an example to inject multiple lines of text for the intro or outro.
[[CO5](Analyse/LOCQ)]

6 + 4 + 2 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	38.54	38.54	10.42

Course Outcome (CO):

After the completion of the course students will be able to

CSEN4237.1. Understand the JavaScript and technical concepts behind Node JS 2

CSEN4237.2. Structure a Node application in modules and use npm and manage node packages

CSEN4237.3. Understand and use the various core module

CSEN4237.4. Build a Web Server in Node and understand how it really works

CSEN4237.5. Build a web application and API more easily using Express

CSEN4237.6. Connect to a MySQL or MongoDB database in Node

CSEN4237.7. Develop commonly used functionalities in web application using various third party packages available in Node environment.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question