

## CS602 Final Exam

### Q1. (30 points)

Write a Node.js module, **projectModule.js**, with the following functionality. The module maintains an array of JavaScript objects, each with the property *projectName*, and a unique *projectId* value. Each project, in turn, has an array of employee JavaScript objects. An employee has the properties, *fullName*, and a unique *employeeId*.

The module should export the functions `lookupByProjectId` and `lookupByEmployeeId`.

The function `lookupByProjectId` should return the JavaScript object from the data whose `projectId` matches the specified argument. If the specified id is not present, `undefined` is returned.

The function `lookupByEmployeeId` should return the **array** of JavaScript objects from the data that has all the projects in which the specified employee is working. If the specified `employeeId` is not assigned to any project, `[]` is returned.

**Write the code for the two module functions using JavaScript.** The template file is shown below. Please note that there can be any number of projects and any number of employees for each project in the data.

projectModule\_template.js x

```
var data = [
  {
    projectName: "Project1", projectId: 'p1',
    employees: [
      {fullName: "John Doe", employeeId: 'e1'},
      {fullName: "Jane Smith", employeeId: 'e2'}
    ]
  },
  {
    projectName: "Project2", projectId: 'p2',
    employees: [
      {fullName: "John Doe", employeeId: 'e1'},
      {fullName: "Mary Jones", employeeId: 'e3'},
      {fullName: "Bill Evans", employeeId: 'e4'}
    ]
  }
];

// Write the code for the following two functions

module.exports.lookupByProjectId = function (id) {
};

module.exports.lookupByEmployeeId = function (id) {
};
```

Sample Output for lookupByProjectId('p2'):

```
{ projectName: 'Project2',  
  projectId: 'p2',  
  employees:  
    [ { fullName: 'John Doe', employeeId: 'e1' },  
      { fullName: 'Mary Jones', employeeId: 'e3' },  
      { fullName: 'Bill Evans', employeeId: 'e4' } ] }
```

Sample Output for lookupByEmployeeId ('e3'):

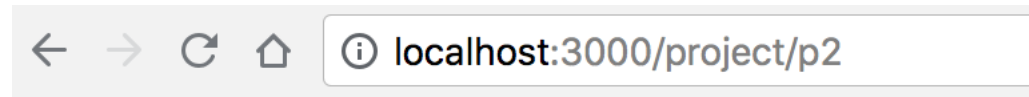
```
[ { projectName: 'Project2',  
  projectId: 'p2',  
  employees:  
    [ { fullName: 'John Doe', employeeId: 'e1' },  
      { fullName: 'Mary Jones', employeeId: 'e3' },  
      { fullName: 'Bill Evans', employeeId: 'e4' } ] } ]
```

Sample Output for lookupByEmployeeId ('e1'):

```
[ { projectName: 'Project1',  
  projectId: 'p1',  
  employees:  
    [ { fullName: 'John Doe', employeeId: 'e1' },  
      { fullName: 'Jane Smith', employeeId: 'e2' } ] },  
  { projectName: 'Project2',  
    projectId: 'p2',  
    employees:  
      [ { fullName: 'John Doe', employeeId: 'e1' },  
        { fullName: 'Mary Jones', employeeId: 'e3' },  
        { fullName: 'Bill Evans', employeeId: 'e4' } ] } ]
```

## Q2. (20 points)

Using the **projectModule** functionality from Question1, show how you would develop Node web application that can display the information about the requested project. The web application should handle GET requests for the form /project/<projectId>



Project id - p2

Project Name - Project2

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Employees in this project:

1. John Doe (e1)
2. Mary Jones (e3)
3. Bill Evans (e4)

The server code using the Express and handlebars framework is shown below. **Write only** the code for the /project/:id route as given in the template code below. The project should be looked up using the **projectModule** from the previous question. This project should be passed as the model for the **projectView** page.

```
server_template.js  x
const express = require('express');
const app = express();

// setup handlebars view engine
const handlebars = require('express-handlebars');
app.engine('handlebars', handlebars({}));
app.set('view engine', 'handlebars');

// Use the project module
const pm = require('./projectModule');

// Write the code for the following route

app.get('/project/:id', function(req, res) {

});

app.listen(3000, function(){
  console.log('http://localhost:3000');
});
```

Now, write the **projectView** page for rendering the corresponding project. The template for the page is shown below.

```
projectView_template.handlebars x
Project id -
<p>
Project Name -
<hr/>
Employees in this project:
<ol>
<li>
</li>
</ol>
```

### Q3. (15 points)

Write a PHP script for determining which characters inside of a given array are vowels (a, e, i, o, u), consonants, and integers. You can assume that the array only holds letters and numbers and you do **not** need to handle objects. The letters in the array are strings of unit length. The numbers in the array will only be single digit numbers. The PHP function **is\_int(arg)** returns true if the given argument is an integer. Note that the code should work for any size array containing a mixture of vowels, consonants, and single digits.

Example Input:

```
$chars = array("a", "b", "i", "c", "e", "f", 0, "z", 2);
```

The output for the above example input should be as follows.

Vowels: aie

Consonants: bcfz

Numbers: 02

The template code for php script is shown below. Write only the missing functionality in the solution.

q3\_template.php



```
<?php
    $chars = array("a", "b", "i", "c", "e", "f", 0, "z", 2);

    $vowels = "";
    $consonants = "";
    $numbers = "";

    // Write your code only for the missing functionality

    echo "Vowels: " . $vowels . "<br/>";
    echo "Consonants: " . $consonants . "<br/>";
    echo "Numbers: " . $numbers;
?>
```

**Q4. (15 points)**

Write the code for a PHP class called **Rectangle** that can be used to create rectangle objects.

Your class should include the following information:

- a. A private instance variable named **width** that specifies the width of the rectangle.
- b. A private instance variable named **height** that specifies the height of the rectangle.
- c. A constructor with two arguments that creates a rectangle with the specified width and height.
- d. A method named **getArea()** that returns the area of the rectangle.

Hint:  $\text{Area} = \text{width} * \text{height}$

Now, write the code for a PHP class, **Square**, extending the Rectangle class, with **no** private instance variables and with a single constructor with the side of the square as the only constructor argument.

Now, create an instance of **Rectangle** with a width of 10 and a height of 20. Show how you would display the area of this rectangle.

Now, create an instance of **Square** with a side of 20. Show how you would display the area of this square.

A template for the Rectangle class is shown below.



```
<?php
class Rectangle {

    // Property declarations

    // constructor
    public function __construct(____, ____){

    }

    public function getArea() {

    }

}

?>
```

### Q5. (20 Points)

Given the following JSON structure in the file **bu\_students.json**,

```
bu_students.json  *
{
  "students": [
    {
      "firstName": "John",
      "lastName": "Smith"
    },
    {
      "firstName": "Sallie",
      "lastName": "Jones"
    }
  ]
}
```

and the following input form for submitting new data:

```
<form action="insert.php" method="post">
  First Name:
  <input type="text" name="firstName">
  <br/>
  Last Name:
  <input type="text" name="lastName">
  <br/>
  <input type="submit" name="submit"
    value="Submit">
</form>
```

Write the code for the PHP script **insert.php**, that will insert the submitted data to the json file. For example, if the form was submitted using the first name, Bob, and last name, Dylan, the resulting **bu\_students.json** file should as follows:

bu\_students.json

✖

```
{
  "students": [
    {
      "firstName": "John",
      "lastName": "Smith"
    },
    {
      "firstName": "Sallie",
      "lastName": "Jones"
    },
    {
      "firstName": "Bob",
      "lastName": "Dylan"
    }
  ]
}
```

The template code for insert.php is shown below. Write only the missing functionality in the solution.

```
insert_template.php x
<?php

// Check to see if the form was submitted
if(isset($_POST['submit'])) {

    $file = 'bu_students.json';
    $str_data = file_get_contents($file);
    $json_data = json_decode($str_data,true);

    // Remove submit from our POST array, we don't want to add it to the file
    unset($_POST['submit']);

    // Write your code only for the missing functionality
    // Create a new student, populate it and append it to the bu_students

    $fh = fopen($file, 'w')
        or die("Error opening output file");
    fwrite($fh, json_encode($json_data,
        JSON_UNESCAPED_UNICODE|JSON_PRETTY_PRINT));
    fclose($fh);
    header('Location:succcess.php');
} else {
    echo 'Sorry, nothing was submitted.';
}
?>
```

The insert.php script redirects the browser to success.php.

Now, write the code for PHP script **success.php** that will read the contents of the json file and shows the output as follows:

# Success!

The student was added!

Smith, John  
Jones, Sallie  
Dylan, Bob

The template code for success.php is shown below. Write only the missing functionality in the solution.

success\_template.php x

```
<!DOCTYPE HTML>
<html>
<head>
    <meta charset="utf-8" />
    <title>Success</title>
</head>
<body>
    <h1>Success!</h1>
    <p>The student was added!</p>

    <?php
        $file = 'bu_students.json';
        $str_data = file_get_contents($file);
        $json_data = json_decode($str_data,true);

        // Write your code only for the missing functionality

    ?>

</body>
</html>
```