Applied Internet Technology (CSCI-UA.0480) - Sample Questions

- **A reference is provided on the last page.**
- **This does not represent the length of the actual midterm (this has more questions)**

1. Two broad categories of databases are relational and NoSQL. NoSQL databases can further be categorized by the way that they store their data:

   a) Name 3 categories / types of NoSQL databases

   b) What type of NoSQL database is MongoDB?

2. In your Express projects, what are the following two files used for and what are their contents?

   a) `.gitignore`

   b) `package.json`

3. Read the code in the 1st column. Answer questions about the code in the 2nd and 3rd columns.

Code	Question 1	Question 2

`var vegetable = 'kohlrabi';`
`var fruit = 'rambutan';`
 	
`var say_food = function() {`
`  vegetable = 'broccolini';`
`  var fruit = 'lychee';`
`  console.log(vegetable, fruit);`
`};`
 	
`console.log(vegetable, fruit);`
`say_food();`
`console.log(vegetable, fruit);`
	What is the output of the code on the left?	What is the type of the variable, `say_food`?

`function foo() {`
`  console.log(arguments[1]);`
`  console.log(arguments[0]);`
`}`
 	
`foo('bar', 'baz', 'qux', 'quux');`
	What is the output of the code on the left?	Besides `arguments` and the actual defined parameters, what other variable is added to the context of a function (that is, made available to the body of the function) when it is called?

`function calculate(num) {`
`  var magicNumber = 5;`
`  return function(n) {`
`  return n * (num - magicNumber);`
`  };`
`}`
 	
`var calculateTen = calculate(10);`
`console.log(calculateTen(3));`
	What is the output of the code on the left?	What concept does the code on the left illustrate (what JavaScript feature allows the inner anonymous function to access particular variables)?

4. Create a form that `POST`s to the path `/user/add`
   a) the form should have 2 input elements, a firstName and a lastName
   b) .....as well as a submit button

5. You just bought the domain, `wholikespizza.com` (um, congratulations?)! You decide to create a single serving site on the domain. Your site contains just one page, and that page simply has the text '`ME`' on it. Create a barebones Express application to run your site by following the specifications below:

   a) all of the code will be in a single file called `app.js`
   b) your app will **respond to `GET`** requests on `/` (the root directory of your site)
   c) the **body** of your app's response will be the text, '**`ME`**' (**no views** or templates necessary)
   d) it should **listen on port 80**
   e) remember to write up all of the setup code necessary for a barebones Express application (even starting with the require!)
   f) write the contents of `app.js` below:

6. Describe how inheritance works in JavaScript. What mechanism is used to create objects that inherit properties from *parent* objects. If a property is not found in an object, where will JavaScript continue to look to find that property?

7. Name one HTTP request headers and one HTTP response headers. Explain what each represents:

   a)

   b)

8. Name three ways that functions are invoked, and explain what the variable, `this`, is set to in each case. The first box is already filled in, complete the remaining five boxes:

Invocation	**`this`**
***Regular* function call**	

9. Using the following code, write out the output and **briefly** explain the reason for the output in the table below.

```
var obj = Object.create(Array.prototype);
obj.foo = 'bar';
console.log((typeof obj.foo));
console.log((typeof obj.baz));
console.log((typeof obj.push));
console.log(obj.hasOwnProperty('foo'));
console.log(obj.hasOwnProperty('push'));
console.log(obj.hasOwnProperty('toString'));
```

#	Output	Reason
1		
2		
3		
4		
5		
6		

10. You're a mad scientist that loves stitching together parts of Arrays to make new Franken-arrays! To aid in your Mary Shelley-esque experiments, you create a function called `joinHalves`.

    a) The function should have **two parameters**, **`firstArray`** and **`secondArray`**, with both expected to be `Arrays` (of course!)
    b) There is no need to validate or check the type of the incoming arguments.
    c) The function will **return a new `Array`** consisting of the **first half of `firstArray`** and **second half of `secondArray`**
    d) If there are an odd number of elements, use `Math.floor` or `Math.ceil` appropriately so that lesser elements are taken / added to the new `Array`. For example
       - `firstArray`: `[1, 2, 3, 4, 5, 6, 7]` ... would contribute `[1, 2, 3]` to the beginning of the new Array
       - `secondArray`: `['a', 'a', 'a']`... would contribute `['a']` to the second half of the new Array
       - The result of `join_halves([1, 2, 3, 4, 5, 6, 7], ['a', 'a', 'a']) would be [1, 2, 3, 'a']`

11. Debug the following code. You have an Express app using handlebars as a templating engine to generate html. An image on one of your pages is showing up as a broken image icon...

    a) What are some steps that you would take to debug this problem. Be exact – discuss the tools that you would use and what you're looking for.

    b) What are some possible errors (that is, where can these errors occur?); again, be as exact as you can.

12. Describe two reasons for using a separate templating engine for rendering an HTML document rather than emitting HTML directly as a string from within your application code?

13. Create a site using Express and handlebars templates:

    a) It should **respond to `GET`S on** two URLs: **`/old`** and **`/new`**
    b) **`/old`** will **redirect** to **`/new`**
        - the response status code can be any of the redirect class status codes (or the default if your implementation doesn't require an explicit status code to be sent)
    c) `/new` will display a list of names
        - as an unordered list in HTML)
        - these names can be stored as a global variable in your application
        - the names in the list are: 'Gil', 'Jill', 'Bill' and 'Phil'
        - this global variable can then be passed as context when your template is rendered
        - assume that the **template** or view that you specify will be **called `names.handlebars`**
    d) Write the contents of the following files in your project to implement the specifications outlined above:

`app.js`

```
// omit setup code (imagine that it is already present above for express and handlebars)

// define your two routes below this line
```

`/views/names.handlebars`

`/views/layouts/main.handlebars`

14. Answer the questions in the 2nd column about the code in the 1st column:

Code	Questions

`function Foo(num) { this.x = num;}`
`Foo.prototype.printX = function()`
`{ console.log(this.x); }`
`function Bar(num1, num2) {`
`  Foo.call(this, num1);`
`  this.y = num2;`
`}`
`Bar.prototype =`
`Object.create(Foo.prototype);`
`var b =  new Bar(100, 200);`
`b.printX();`
`console.log((typeof Foo))`
	What is the output of this program?
	
	What would this refer to if the keyword new were omitted?

15. What does the **`Array`** method, **`map`**, do? **Implement your own version of `map`** (call it `myMap`). Your method will have an `Array` as one parameter, and a function as the other parameter. It will do the same thing that the actual `Array map` method does (but with the `Array` object passed in as a parameter, rather than as an object that the method is called on). For example, the following two should be equivalent:

    (assuming numbers is an `Array`, like `[2, 4, 6, 8]`)

    ```
    a) numbers.map(myCallback);
    b) myMap(numbers, myCallback);
    ```

    Implement `myMap` below:

16. Write an example URL, and label each part of the URL below (`http://` is already filled out; there are 6 parts total)

    Labels: 1)_____ 2)_____ 3)_____

    Example URL: **`http://`** _____:_____ __/_____?_____ _____

    Labels: 2)_____ 5)_____ 6)_____

17. Imagine that you have a collection called **`links`** in your database. It contains documents that look like:

    `{ name: …, url: ….}`

    a) Using the commandline client, add a new link document with name: snowman … and url: http://unicodesnowmanforyou.com.

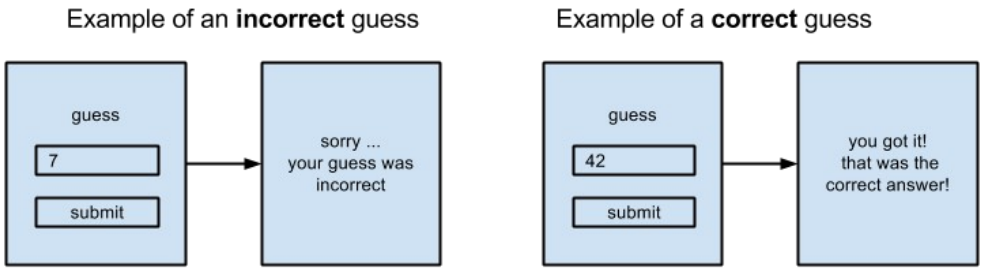
    b) Assuming that there are other links in the collection, write a query using the commandline client that retrieves a single link (it doesn't matter which one, just a single link, though)

    c) Using the Mongoose API, get all of the links in the collection and simply log out the results with console.log once the query gives back a result. Assuming that a schema and model constructor already exist, and you already have the setup code:

    ```
    var Link = mongoose.model('Link');
    ```

18. **Create a web app** that's a **number guessing game**. At minimum, it should have:

* a regular Express app (along with its basic setup/configuration) to handle incoming requests
* a global variable in your app that represents a secret number
* a **form** where a user can submit a number
* after the submission, some way of determining whether or not the person's matches the secret number stored globally
* a **page** or **pages** that **shows if you've guessed right**... or if you've guessed incorrectly
* it's up to you to determine how many routes you'd like to make, as well as what requests you'd like to handle
* here are some examples of how the user may flow through win and lose scenarios:



a) **Write the setup code** and **routes** that would go in your **`app.js`** file. However, in place of the setup code for handlebars and the module that allows you to access the body property of the request, just write in `"// handlebars setup" or "// request.body"` where appropriate.

b) Imagine that your handlebars layout file is already created (along with the app.js file you've coded above). Use the routes and callbacks you've defined in your `app.js` file to create the **template files and the mark-up** (this depends on your implementation) that you'd need to use so that all pages in your app are rendered correctly. **Include both** the template's **path** (relative to the project root) and **name**, as well as its **contents**. For example: (5 points)

```
name and path – path/to/myViews/myFancyTemplate.handlebars
contents – <p>Some content</p>
```

Reference

Array

properties

length

methods

pop()

reverse()

sort([compareFunction])

splice(index, howMany[, element1[, …[, elementN]]])

slice(index, howMany[, element1[, …[, elementN]]])

join([separator = ','])

concat(value1[, value2[, ...[, valueN]]])

indexOf(searchElement[, fromIndex = 0])

forEach(callback[, thisArg])

map(callback[, thisArg])

filter(callback[, thisArg])

reduce(callback[, initialValue])

some(callback[, thisArg])

every(callback[, thisArg])

String

properties

length

methods

split([separator][, limit])

toUpperCase()

slice(beginSlice[, endSlice])

replace(regexp|substr, newSubStr|function[, flags])

Object

getPrototypeOf(obj)

hasOwnProperty(prop)

Request Object

properties

url

headers

method

path

query

body

session

Response Object

methods

writeHead

end

send

render

redirect

set

status