CS 142 Midterm Examination

Spring Quarter 2019

You have 1.5 hours (90 minutes) for this examination; the number of points for each question indicates roughly how many minutes you should spend on that question. Make sure you print your name and sign the Honor Code below. During the examination you may consult two double-sided pages of notes; all other sources of information, including laptops, cell phones, etc. are prohibited.

I acknowledge and accept the Stanford University Honor Code. I have neither given nor received aid in answering the questions on this examination.

____
(Signature)

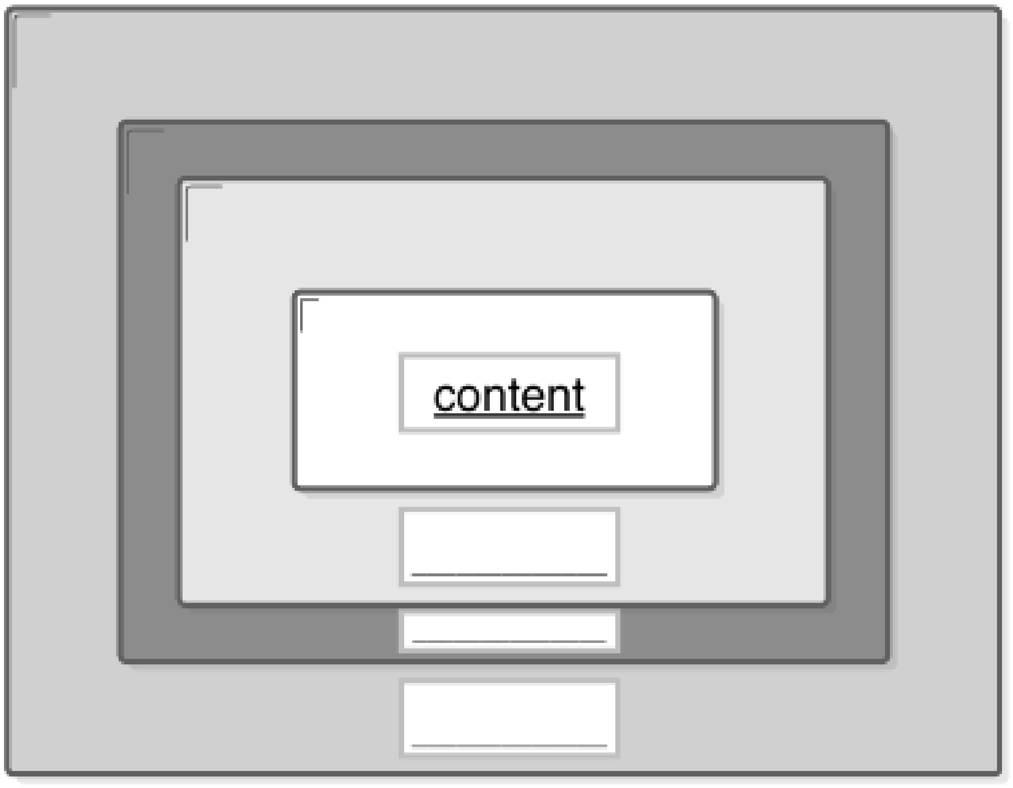
____
(Print your name, legibly!)

______________________________________@stanford.edu
(Stanford email account for grading database key)

Problem	#1	#2	#3	#4	#5	#6	#7	#8	#9	
Points	6	6	4	6	4	4	6	8	6	
Problem	#10	#11	#12	#13	#14	#15	#16	#17	#18	Total
Points	4	4	4	6	6	4	4	4	4	90

Problem #1 (6 points)

A. Fill in the blanks on the CSS box model diagram. Which is margin? padding? border?



B. What is the distance between the letters A and B if you had the following CSS rule?

```
A<div></div>B

div {
        height: 100px;
        width: 100px;
        padding: 10px;
        border-left-style: dotted;
        border-left-width: 5px;
        margin-top: 10px;
        margin-right: 20px;
        display: inline-block;
}
```

Problem #2 (6 points)

When discussing the idea called **Single Page Applications** (SPA) in class we introduced the term **deep linking**. Show your understanding of these two terms by answering the following questions about them.

A. The example single page applications we described in class supported deep linking. Could you have a single page application that didn't support deep linking? If so, describe what the shortcomings would be for it. If not, explain why not.

B. Could you have a web application that did not use the single page application approach (i.e. multiple pages) that supported deep linking? Justify your answer.

Problem #3 (4 points)

Most JavaScript frontend frameworks use the Model, View, Controller (MVC). Where Angular and VueJS spread the view and controller parts across different files, ReactJS combines the parts in a single file. For each of the blanks in the React component definition below, classify if the method function would be considered *view* or *controller*. Provide a brief explanation of your classification below your answer.

```
class Board extends React.Component {
  constructor(props) {
    super(props);
    this.state = { squares: [] };
  }
  componentDidMount() {                                  _______________________
    axios.get(`http://example.com/squares`)
      .then(res => {
        this.setState({ squares: res.data });
      })
  }
  handleClick(i) {                                        _______________________
    const squares = this.state.squares.slice();
    squares[i] = 'X';
    this.setState({squares: squares});
  }
  renderSquare(i) {                                        _______________________
    return (
      <Square
        value={this.state.squares[i]}
        onClick={() => this.handleClick(i)}
      />
    );
  }
  render() {                                              _______________________
    return (
      <div>
        <div className="board-row">
          {this.renderSquare(0)}
          {this.renderSquare(1)}
          {this.renderSquare(2)}
        </div>
      </div>
    );
  }
}
```

Problem #4 (6 points)

An URL is composed of multiple components including:

A. Query parameters
B. Fragment
C. Port
D. Hostname
E. Scheme
F. Hierarchical portion

A. Identify by underline and labeling with the letters above (i.e. A-F) indicate where the above URL components are on this URL:

```
http://myth42.stanford.edu:3000/midterm/urls/links.html?year=3000&user=Mendel
```

B. Javascript Regular Expression literals can have many of the common punctuation characters in the character set. For example `/[.*+?^${}()|[\]\\#@%&;:]/` is a valid regular expression literal.

1. Describe the issues that would arise if your web app needed to pass arbitrary regular expressions in URLs to the web app's backend.

2. Describe how could you work around this problem.

Problem #5 (4 points)

Your browser currently is on `http://cs.stan.edu/a/b/c.html`. Write the resulting URLs for clicking on each of the following links:

```
A. <a href=”123.html”>a</a>
```

```
B. <a href=”/234.html”>b</a>
```

```
C. <a href=”#c”>c</a>
```

```
D. <a href=”http://google.com”</a>
```

Problem #6 (4 points)

```
class MyComponent extends React.Component {
    constructor(props) {
      super(props);
      this.state = {
           pageStatus: 'rendering...',
      };
    }

    updatePageStatus() {
      this.setState({
          pageStatus: 'rendered!',
      });
    }

    render() {
      this.updatePageStatus();
      return (
          <div>
            {this.state.pageStatus}
          </div>
      );
    }
}
```

If we added this component to the view, our app would crash. Describe what the problem is here.

Problem #7 (6 points)

You are given the following HTML document:

```
<html>
  <head>
  </head>
  <body>
    <div id="container"></div>
  </body>
</html>
```

Write JavaScript code using the DOM to make the document look like this:

```
<html>
  <head>
  </head>
  <body>
    <div id="container">
      <p class="pClass">My paragraph.</p>
      <span id="mySpan" style="visibility: hidden;">My span.</span>
    </div>
  </body>
</html>
```

You may NOT use assignment to the innerHTML in your solution.

Problem #8 (8 points)

Given the following HTML file, what will the five DOM expressions below return?

```
<html>
  <head>
    <title>getElementById example</title>
  </head>
  <body>
    <div id="div1">CS142 div1</div>

    <div id="div2">
      <div id="div3" class="coolDiv">CS142 div3</div>
      <span id="div4" class="boldText">CS142 div4</span>
      <div id="div5" class="redDiv">CS142 div5</div>
    </div>

    <div id="div6">
      <h2>This is a header.</h2>
      <p>This is a paragraph.</p>
      <b class="boldText">This is bold.</b>
      <i>This is italic.</i>
    </div>
  </body>
</html>
```

A. `document.getElementById('div1').textContent`

B. `document.getElementsByTagName('p')[0].innerHTML`

C. `document.getElementsByClassName('boldText').length`

D. `document.getElementById('div5').parentNode.nextElementSibling.firstElementChild.tagName`

E. `document.body.firstElementChild.nextElementSibling.nextElementSibling.getElementsByTagName('span').length`

Problem #9 (6 points)

You are initially given this simple HTML document containing two buttons:

```
<html>
  <head>
  </head>
  <body>
    <button id="cs109Button">Enroll in CS 109</button>
    <button id="cs142Button">Enroll in CS 142</button>
  </body>
  <script>
      function Course(courseName) {
        this.courseName = courseName;
        this.id = courseName + '_id';

        document.getElementById(courseName + 'Button').onclick = function(e){
           console.log('The target for this event is  ' + e.target.id);
           console.log('The currentTarget for this event is  ' +
                                                  e.currentTarget.id);
           console.log('Successfully enrolled in ' + this.courseName);
         };
       }

       var cs142 = new Course('cs142');
  </script>
</html>
```

A. When you click on the button with the text "Enroll in CS 142", what gets printed to the console? Explain why.

B. When you click on the button with text "Enroll in CS 109", what gets printed to the console? Explain why.

Problem #10 (4 points)

You are given the following HTML document and JavaScript which adds event listeners to some of your document elements (hint: the 3rd argument of addEventListener is useCapture):

```
<html>
  <head>
  </head>
  <body>
      <div id="outerDiv">
            div id="innerDiv">CLICK ME</div>
      </div>
  </body>
  <script>
      var body = document.body;
      var innerDiv = document.getElementById('innerDiv');
      var outerDiv = document.getElementById('outerDiv');

      innerDiv.addEventListener("click", function (e) {
        console.log('div-inner-bubble');
      }, false);

      outerDiv.addEventListener("click", function (e) {
        console.log('div-outer-bubble');
      }, false);

      body.addEventListener("click", function (e) {
        console.log('body-bubble');
      }, false);

      body.addEventListener("click", function (e) {
        console.log('body-capture');
        e.stopPropagation();
      }, true)
  </script>
</html>
```

What gets printed to the console when you click the words "CLICK ME"? Explain your answer:

Problem #11 (4 points)

If this program is executed, what will be logged on the console?

```
function Friend() {
  this.arrive = function () {
    console.log('Hello');
  };
}

var friend1 = new Friend();
var friend2 = new Friend();
friend2.arrive = function () {
  console.log('Hi');
};
friend1.arrive();
friend2.arrive();

Friend.prototype.leave = function () {
  console.log('Bye');
};
friend1.leave();
friend2.leave();
var friend3 = new Friend();
friend3.leave();
friend3.leave = function () {
  console.log('Adieu');
};
friend3.leave();
friend2.leave();
```

Problem #12 (4 points)

For each of the testing programs list below, classify them as examples of:

- unit testing
- end-to-end testing

Briefly explain your answer.

A. A program opens a browser, navigates to a web app, and makes sure that the log in and sign in process works.

B. A program checks that a sidebar component collapses correctly.

C. A program utilizes mock components and DOM for testing.

D. A program containing:

```
describe('sorting the list of users', function() {
   it('sorts in descending order by default', function() {
      var users = ['jack', 'igor', 'jeff'];
      var sorted = sortUsers(users);
      expect(sorted).toEqual(['jeff', 'jack', 'igor']);
   });
 });
```

Problem #13 (6 points)

JavaScript contains two keywords for declaring a variable: `var` and `let`. Although both declare variables without specific types, they behave differently. For each of the following two code fragments, state what the console log output would be if `VARLET` was set to `var` and `let`. Assume that code is run using "use strict" JavaScript rules.

Code Fragment A	**Code Fragment B**

```
try {
  i = 10;
  for (VARLET i = 0; i < 5; i++) {
     console.log(i);
  }
  console.log(i);
} catch (err) {
  console.log("ERROR");
}
```
	```
	try {
	  for (VARLET j = 0; j < 5; j++) {
	     console.log(j);
	  }
	  console.log(j);
	} catch (err) {
	  console.log("ERROR");
	}
	```

A: VARLET = **`var`** `console log output:`	**B:** VARLET = **`var`** `console log output:`
A: VARLET = **`let`** `console log output:`	**B:** VARLET = **`let`** `console log output:`

Problem #14 (6 points)

The functions and properties defined in JavaScript class definitions end up being stored in various objects when instances of the class are created. Some of the objects used include:

- Instance - The instance object
- Prototype - The prototype object of an instance
- Constructor - The constructor function of the class

For each of the parts of the class listed below, state which of the above objects they end up in. Provide a brief explanation of your answer.

A. Class methods

B. Class static properties

C. Instance properties

Problem #15 (4 points)

Write a JavaScript function (create_a_closure) that causes a closure to be created when called. The created closure should contain the variables `myNum`, `myStr`, `myBool` declared below:

```
let myNum = 1;
let myStr = '1';
let myBool = true;

function create_a_closure() {








}
```

Problem #16 (4 points)

For each of the JavaScript code fragments below, describe what would be printed to the console log when the code is run. Recall the `setTimeout` function take an arguments a function and number of milliseconds and will call the function in the specified number of milliseconds.

A.

```
for (var  x = 1; x < 5; x++) {
   setTimeout(function () { console.log(x); }, 1000*x);
}
```

B.

```
function f(a) { console.log(a); }
for (var  x = 1; x < 5; x++) {
   setTimeout(function () { f(x); }, 1000*x);
}
```

Problem #17 (4 points)

```
class ClickComponent extends React.Component {
    constructor(props) {
      super(props);
      this.handleClick1 = this.handleClick1.bind(this);
    }
    handleClick1() {
       console.log("Handle Click 1 called");
    }
    handleClick2() {
       console.log("Handle Click 2 called");
    }

    render() {
      return (
        <div>
          <div onClick={this.handleClick1}>Click #1 using .bind</div>
          <div onClick={() => this.handleClick2()}>
             Click #2 using arrows
          </div>
          <div onClick={() => this.handleClick1()}>
            Click #3 using combined
          </div>
        </div>
      );
    }
}
```

The event handling patterns use on the <div> regions with content "Click #1 ..." and "Click #2 ..." follow one of the standard React patterns for handling events discussed in lecture. The "Click #3 ..." uses a strange combination of both the .bind and arrow function approaches. Would this work? Justify your answer.

Problem #18 (4 points)

Use the definition of `ClickComponent` from Problem #17 in the question.

If you created one of these ClickComponent (e.g. had `<ClickComponent />` in some render function) somewhere inside of the ReactJS runtime it would do a

```
    new ClickComponent()
```

which would create a new object of class ClickComponent. Like all class JavaScript objects, this newly created object (**`object`**) would have a prototype object (**`prototype`**). Fill in the table below indicating if the specified code fragment would generate accesses to these two objects (**object** and **prototype)** by:

Marking R if the code fragment reads the object.

Marking W if the code fragment writes (or reads and writes) the object.

Leave the cell blank if no access is made. Note for the onClick fragments assume that click event happens.

JavaScript Code Fragment	**`object`**	**`prototype`**
`this.handleClick1 = this.handleClick1.bind(this);`		
`onClick={this.handleClick1}`		
`onClick={() -> this.handleClick2}`		
`onClick={() -> this.handleClick1}`		

Additional page to make page count even - no problem.