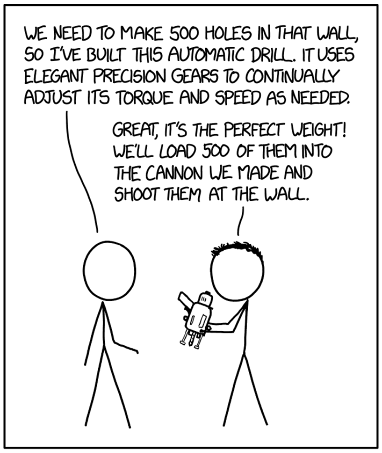
CS312 Spring 2020 – Midterm

Name: ____

Honor Code:

Signature: ________________________________

This exam is open notes, open course notes and open slides but no other sources are permitted (e.g. Google, StackOverflow, and other resources, even if linked from the course page, are not permitted). Attempting to execute any of the code samples is not permitted. There is no time limit, **but you must submit your completed exam to Gradescope by the deadline** (think of this as like a homework assignment that you complete entirely on your own). You can print and complete the exam using this template, or on separate sheets of paper. Read the problem descriptions carefully and write your answers clearly and legibly. Circle or otherwise indicate your answer if it might not be easily identified.


WE NEED TO MAKE 500 HOLES IN THAT WALL, SO I'VE BUILT THIS AUTOMATIC DRILL. IT USES ELEGANT PRECISION GEARS TO CONTINUALLY ADJUST ITS TORQUE AND SPEED AS NEEDED.
GREAT, IT'S THE PERFECT WEIGHT! WE'LL LOAD 500 OF THEM INTO THE CANNON WE MADE AND SHOOT THEM AT THE WALL.

HOW SOFTWARE DEVELOPMENT WORKS

Question	Points	Score
JavaScript	24	
React	24	
Agile Practices	17	
Client Server	15	
Data Modeling and Databases	14	
Total:	94	

Question 1: JavaScript [24 points]

(a) (6 points) Describe the type and length of the return value for each of these methods invoked on an `Array` of length `n`, e.g. `slice` returns an `Array` of length ≤ `n`.

i. `map` ____

ii. `reduce` ____

iii. `filter` ____

iv. `forEach` ____

(b) (2 points) Choose ONE answer. Helen is creating a JavaScript (JS) application to keep track of her favorite books and plays. She implemented separate JS classes for `Book` and `Play`, because even though both have a `title` and `author`, they are otherwise very different: for example, a `Play` has a `numberOfActs` and other properties that don't apply to a `Book`. Helen needs to sort a combined array of books and plays by their title. What design should she use to solve this problem in JS?

A. `Book` and `Play` must be subclasses a common class, e.g. `Manuscript` that has the `title` property.

B. As long as `Book` and `Play` both have an attribute named `title`, Helen can use the `Array.sort` method with a callback that compares titles.

C. Helen must create a custom sort function that invokes different comparison functions depending on the types of the values to be compared.

D. Helen must separate the collection into two collections (one containing only Books and the other only Plays), sort each collection, then merge the two sorted collections.

(c) (2 points) Choose ONE answer. Which of the following Jest features helps us implement tests that satisfy the "R" in F.I.R.S.T.?

A. The "watcher" that automatically runs the tests when a file changes

B. The many different matchers, e.g. `toBeFalsy`.

C. Multiple `expect` calls in a single test

D. The `beforeEach` and `afterEach` functions

(d) (6 points) Assume we wrote a helper function for Simplepedia, `toSection`, that takes an article as its argument and returns the capitalized first letter of the title (e.g. its section). Write a single F.I.R.S.T. unit test using Jest for that function.

(e) (8 points) `waitSeconds(sec)` returns a promise that resolves after `sec` seconds have elapsed. `elapsedSeconds(date)` returns the time in seconds between now and the `date` argument. Write example valid output from running this code with `node`. Make sure to include the correct label, e.g. “Delay 1”, with each statement.

```
let current = Date.now();
console.log(`Delay 1: ${elapsedSeconds(current)}s`);
waitSeconds(3)
  .then(() => {
    console.log(`Delay 2: ${elapsedSeconds(current)}s`);
    return waitSeconds(2);
  })
  .then(() => {
    console.log(`Delay 3: ${elapsedSeconds(current)}s`);
  })
  .catch(() => {
    console.log(`Delay 4: ${elapsedSeconds(current)}s`);
  });
console.log(`Delay 5: ${elapsedSeconds(current)}s`);
```

Question 2: React [24 points]

(a) (8 points) There are several correctness problems with this React component for displaying and creating to-do list items (i.e. not just poor style). Identify three (3) such problems referencing line numbers as appropriate. Each problem should be distinct, not just a variation on the same problem. You do *not* need to provide a fix for the problems you identify.

```
 1  import React, { useState } from 'react';
 2  function ToDo(props) {
 3    const [newItem, setNewItem] = useState('');
 4
 5    const truncate = true;
 6    const showItems = truncate ?
 7      props.items.slice(0, props.numToShow) :
 8      props.items;
 9
10    return (<div>
11      <ul>{showItems.map(item => <li key={item}>{item}</li>)}</ul>
12      <p onClick={() => { setTruncate(!truncate); }}>...</p>
13      <input value={newItem} onChange={(evt) => {
14        newItem = evt.target.value;
15      }}/>
16      <button onClick={() => { props.items.push(newItem); }}>Add</button>
17    </div>);
18  }
```

(b) (8 points) The `ToDo` component is intended to have a feature that restricts the number of visible elements if the `items` prop is longer than some threshold. The user can click the ellipsis (`...`) to toggle the truncation, i.e. show all the items or just a subset. Write a Gherkin-style test scenario(s) that covers this toggling behavior. You do *not* need to provide the implementation details of the tests, just describe the scenario for the test.

(c) (8 points) As part of your to-do list application, you want to automatically convert any correctly formatted links in the to-do text into an actual "clickable" link, i.e. an HTML '`<a href="..."></a>` element. Briefly describe how would implement that feature in your React application (no code is expected, just a description of your approach). You may propose other React components if appropriate. Your solution will be evaluated based on maintainability and testability.

Question 3: Agile Practices [17 points]

(a) (4 points) Proponents of the Scrum process assert that Scrum is at its best when it is difficult to plan ahead. Briefly describe the arguments for that assertion.

(b) (2 points) Choose ONE answer. You have an idea for a new feature for your project. According to our CS312 development process, what is your next step?

A. Implement a spike to see if it will work

B. Add it to the project backlog

C. Draw a "lo-fi" storyboard

D. Write a user story

E. Pitch it at the next stand-up

(c) (6 points) Briefly describe three (3) motivations for creating a pull request (PR) as part of our project workflow.

(d) (5 points) Write a S.M.A.R.T. user story for a new feature for the to-do list that enables user to mark a to-do as important, changing its font to bold. Your user story will be evaluated on format and quality.

Question 4: Client Server [15 points]

(a) (5 points) In Simplepedia we purposely did not make any changes to the local article collection until we received a response from the server. Briefly describe why we chose this approach, and did not, for instance, immediately update the collection state after launching the `fetch` request.

(b) (2 points) Select ALL that apply. Given the HTTP request

`GET http://www.example.com:8000/assignments?type=practical`,

which elements of that request does Express use to determine which handler to execute?

A. GET

B. www.example.com

C. :8000

D. /assignments

E. type=practical

(c) (8 points) For each of the following actions in a web application provide a appropriate RESTful HTTP verb and URL, e.g. `GET /api/articles/3`.

i. Read the data for a single to-do list item

ii. Create a new to-do items

iii. Remove a single to-do list item

iv. List all of a user's to-do items

Question 5: Data Modeling and Databases [14 points]

(a) (4 points) Identify the models you would define in your server backend to implement the following user story:

As a user, I want to create a to-do item with a due date, so that I can remember to complete all of my tasks on time

(b) (2 points) Choose ONE answer. You want to extend Simplepedia to track the user who authored an article. To do so you define a `User` model. Which association between `User` and `Article` best models this relationship?

A. A `User` has one `Article`, an `Article` belongs to a `User`.

B. A `User` has many `Article`s, an `Article` belongs to a `User`.

C. A `User` has many `Article`s, an `Article` belongs to many `User`s.

D. A `User` has many `Article`s through `Authorship`, an `Article` has many `User`s through `Authorship`.

(c) (8 points) In addition to authors, you also want to track which users have edited an article and when they did so (only the user and time, you don't need to track how they edited the article). What association between `User` and `Article` would model this relationship. Your answer should be formatted similarly to the answers to the previous part. In your answer note which Model would "know" the time that each user edited the article.