TECHNOLOGICAL UNIVERSITY DUBLIN
CITY CAMPUS

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TU856 - BSc. (Honours) Degree in Computer Science
TU857 - BSc. (Honours) Degree in Computer Science (Infrastructure)
TU858 - BSc. (Honours) Degree in Computer Science (International)

Year 4

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SEMESTER 1 EXAMINATIONS 2021/22

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Rich Web Application Technology

Internal Examiners
Dr. Mariana Rocha
Dr. Paul Doyle

External Examiners
Sanita Tifentale (DT228 / TU856)
Pauline Martin (DT211C / TU857)
Pamela O'Brien (DT282 / TU858)

Two Hours

Instructions to candidates:

Answer **all** question

1 (a) You were required to design a Rich Web Application for a university. Define, with your own words, the term Rich Web Application and explain the differences between web applications and websites. List and describe 2 (two) features of the university rich web application you would develop and what types of technologies you would use to implement each of these features.

(10 marks)

(b) Consider the following code example:

```html
<!DOCTYPE html>
  <html>
    <head>
      <title>Technological University Dublin</title>
    </head>
    <body>
      <section>
        <img src="logo.png" alt="The logo of the Technological University Dublin.">
        <p>Click here and check our Twitter</p><a href="https://twitter.com/wearetudublin">TU Dublin Twitter</a>
        <p>Click here and check our Facebook</p><a href="https://www.facebook.com/TechnologicalUniversityDublin.TUDublin/">TU Dublin Facebook</a>
        <p>Click here and check our webpage </p><a href="https://www.dit.ie">TU Dublin </a>
      </section>
    </body>
  </html>
```

Define Document Object Model and draw a diagram that represents the DOM tree for the code example above.

(10 marks)

Question 1 continues on the next page

(c) Consider you were asked to develop a Chrome extension to modify the page described in question 1b. This extension should:

- Replace the href content inside the third anchor element by https://www.tudublin.ie.
- Manipulate the style of the section elements by changing the font colour of the content in the first paragraph to green, in the second paragraph to blue, and in the third paragraph to red.
- Align the first three paragraphs in the centre of the page.

Provide the JavaScript code that can perform those changes. You should use pure JavaScript and must not use libraries.

(10 marks)

(d) Functional programming is the process of building software by composing pure functions, avoiding shared state, mutable data, and side-effects. Check the following code:

```
let basket = [
    { name: 'Minecraft', price: 10 },
    { name: 'Tetris', price: 5 },
    { name: 'Pac-Man', price: 14 },
    { name: 'The Legend of Zelda', price: 99 },
    { name: 'Donkey Kong', price: 95 }
];
```

   i)   Using the functional programming property of keeping the data immutable, write a code that applies a 20% discount coupon code on the item prices, search for those cheaper than 12 units, and calculate the total basket value if you bought all the products cheaper than 12 units.

   ii)   Explain why, in your opinion, functional programming is a good approach to be adopted in this case.

(18 marks)

(2) (a) Consider the following JSON file:

```json
{"totalItems": 5,
 "items": [
     {"name": "The Art of Computer Programming", "author":"Donald Knuth", "year": "1973" },
     {"name": "Structure and Interpretation of Computer Programs", "author":"Gerald Sussman", "year": "1996" },
     {"name": "The C Programming Language", "author":"Brian Kernighan", "year": "1978" },
     {"name": "Effective C++", "author":"Scott Meyers", "year": "1992" },
     {"name": "Learn Python the Hard Way", "author":"Zed Shaw", "year": "2013" }
 ]
}
```

Explain, with your own words, the main differences between JSON and XML, and the advantages and disadvantages of using each of them. Using the JavaScript Fetch API, write a code to retrieve the data from the JSON example above.

(12 marks)

(b) Consider the following code:

```javascript
const birds = () => {
    console.log('Puffins have black and white plumage.');
    setTimeout(someInfo = () => {
      console.log('Puffins have short wings.');
    });
    console.log('Puffins have large beaks.');

    setTimeout(someData = () => {
      console.log('Puffins are good swimmers.');
    },);
      console.log('Puffins are very intelligent.');
 };
 birds();
```

Describe what will be the output (in the right order) when the code is executed. Explain why the output is displayed in this particular order.

(18 Marks)

(3) (a) Describe Reactive Programming and define what is an observable in Reactive Programming.

(6 marks)

(b) Define web streams and explain the main advantages of using streams in Rich Web Applications development. Thinking about real-life applications, exemplify one rich apps that use or can benefit of using streams.

(6 marks)

(c) Consider the following code:

```html
<!DOCTYPE html>
<html>
<head>
    <title>Counter</title>
</head>
<body>
    <button class="increase-counter">
        Increase Counter
    </button>
    <p class="counter">
        0
    </p>
</body>
</html>
```

Using RxJS, implement a simple app that records the amount of clicks a user does.

(10 Marks)