BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 6 Professional Graduate Diploma in IT

WEB ENGINEERING

Wednesday 12th May 2021 – Afternoon

Answer **any** THREE questions out of FIVE. All questions carry equal marks.

Time: THREE hours.

Answer any <u>Section A</u> questions you attempt in <u>Answer Book A</u>
Answer any <u>Section B</u> questions you attempt in <u>Answer Book B</u>

The marks given in brackets are **indicative** of the weight given to each part of the question.

Calculators are **NOT** allowed in this examination.
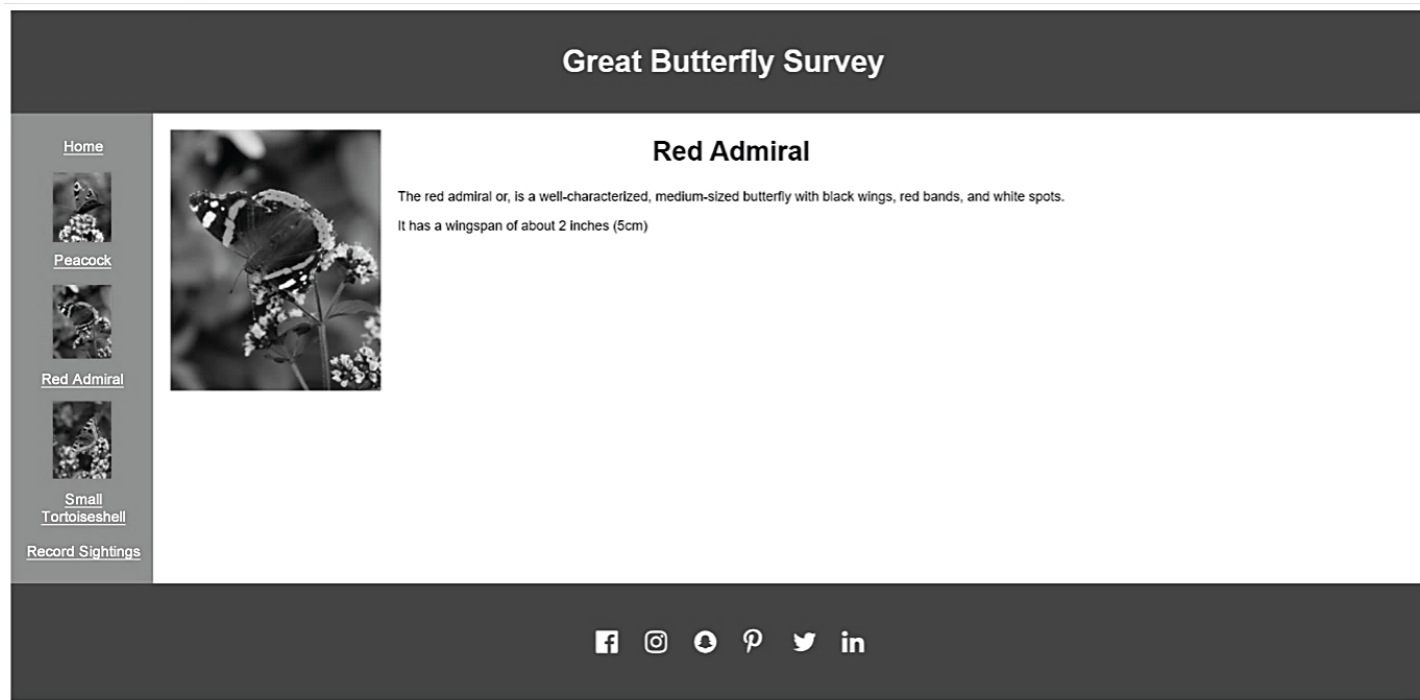
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Figure B5.3

End of Accompanying Figures

Great Butterfly Survey

Welcome to the Great Butterfly Survey

The Great Butterfly Survey allows you to record and report the butterflies that visit your garden over the course of a year. Submit your sightings and help us learn more about the butterflies that visit UK gardens.

Please help us to learn more about garden butterfly populations.

This will allow us to target conservation effort more effectively to help struggling species. Find out more about the Garden Butterfly Survey on the Frequently Asked Questions page.

Peacock

Red Admiral

Small Tortoiseshell

Record Sightings

Figure B5.2

Great Butterfly Survey

Home

Red Admiral

The red admiral or, is a well-characterized, medium-sized butterfly with black wings, red bands, and white spots.

It has a wingspan of about 2 inches (5cm)

Peacock

Red Admiral

Small Tortoiseshell

Record Sightings

Section A
Answer Section A questions in Answer Book A

A1.

a) In a DTD, data can be stored in child elements or in attributes. Describe **FIVE** factors that need to be considered when using attributes instead of child elements and evaluate the reasons for the choice.

(5 marks)

b) The owners of the Whittlesea Bay Fish and Chip Restaurant need to produce an app to keep a record of diners following the imposition of new rules that require them to notify the authorities of any diners present at the same time as someone who has tested positive for Covid-19. They have provided the example data file given in Figure A1.1 (page 8 & 9) as an example. Write a suitable DTD that matches the following constraints:

    i) Every party must include a lead customer
    ii) All customers must provide their name
    iii) All parties must record:
        a. The date of their visit
        b. The time of their entry
        c. The time of their departure
    iv) The lead customer must provide contact details, which may be either a mobile telephone number, a landline number or an email address
    v) A party may be just the lead customer, or may include one or more additional members
    vi) Parties may enter the premises either to purchase a take-away, or to eat in the restaurant, but not both
    vii) Only one customer is allowed to enter the restaurant to collect a take-away
    viii) Customers other than the lead customer can provide additional contact details, as above, but do not have to
    ix) If the party is to be seated in the restaurant, their table number(s) must be recorded.

(16 marks)

c) Following a government change in requirements, it is now necessary to record a photograph of suitable photographic identification of the lead customer. Since the size of the picture may differ at the various restaurants the height and width should also be recorded.

Explain how you would modify your DTD to comply with this.

(4 marks)

[Turn Over]

A2.

  a) What is meant by the following acronyms?

        i)   XHTML;
        ii) DTD;
        iii) XSLT.

    Explain with examples when you would use each.

(12 marks)

  b) What is a:

        i)   web forum;
        ii) IRC;
        iii) WIKI.

    Evaluate how they differ in the way in which they are used and assess the differences that make each appropriate for particular uses, with examples.

    Evaluate how they differ from the traditional web?

(13 marks)

A3.

The **Facebook–Cambridge Analytica** data breach was revealed by an ex-employee in several newspapers in 2018. It was a data leak that allowed millions of Facebook users' personal data to be harvested without consent by a company called Cambridge Analytica, mainly to be used for political advertising. It is the largest known leak in Facebook history.

The data was collected through an app created in 2013 by Dr Aleksandr Kogan, a University of Cambridge academic to assist him in his research. It consisted of a series of questions intended to construct psychological profiles on users who downloaded it. As part of the download process, users were asked for their consent to take part in the study and for their personal data to be collected using the app. The app not only harvested the personal data about the users that completed the questions, but also of their Facebook friends, who neither knew nor consented to their data being shared. Cambridge Analytica marketed subsets of the data to various political campaigns.

The data of nearly 90 million Facebook users was compromised when Cambridge Analytica was given access to data they obtained from Facebook that was collected using the app. This data was used to target individual voters with specific advertisements that were considered to be attractive to them.

  a) What is meant by informed consent in the context of a social media app, such as the one used by the researcher?

(5 marks)

  b) Did Dr. Aleksandr Kogan, Cambridge Analytica or Facebook fail to comply with the informed consent that was originally given when the app was downloaded? Explain your reasoning and evaluate what each should have done to ensure that individuals' personal data was used according to their wishes.

(10 marks)

```
                    </Seated>
            <Visit>
                    <Seated>
                            <Lead_customer>
                                    <Customer>
                                            <Name>
                                                    <First_name>Jim</First_name>
                                                    <Last_name>Adams</Last_name>
                                            </Name>
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                                            </Contact_details>
                                    </Customer>
                            </Lead_customer>
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                            </Time_out>
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            </Visit>
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                                            <Minutes>05</Minutes>
                                    </Time>
                            </Time_in>
                    </Takeaway>
            </Visit>
```

Figure A1.1

```xml
<?xml version="1.0" encoding="UTF-8"?
<?xml-stylesheet type="text/xsl" href="items.xsl"?>
<Visitlog>
    <Visit>
        <Seated>
            <Lead_customer>
                <Customer>
                    <Name>
                        <First_name>John</First_name>
                        <Last_name>Smith</Last_name>
                    </Name>
                    <Contact_details>
                        <Mobile>07888 999999</Mobile>
                    </Contact_details>
                </Customer>
            </Lead_customer>
            <Customer>
                <Name>
                    <Last_name>Williams</Last_name>
                </Name>
                <Contact_details>
                    <Mobile>07999 432123</Mobile>
                    <Telephone>0123 678987</Telephone>
                </Contact_details>
            </Customer>
            <Customer>
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c) A framework of **SIX** ways has been suggested that the scientific community could use to set ethical standards for social media research by:

i) collaborating across disciplines and sectors (eg, academia, industry) to establish conventions in a way that is responsive to rapidly changing technologies;

ii) convening "technology ethics boards" in universities and other research organizations to educate and advise scientists, research participants, IRBs, and the public;

iii) developing coursework on technical ethics that could then be provided to students anywhere social media research is being conducted;

iv) making sure that Independent Review Boards have access to training on the responsible conduct of social media research to develop the necessary expertise to review it;

v) research funders ensuring that scientific review panels include expertise in technology ethics when grants describing social media research are being reviewed;

vi) communicating of both established and emerging ethical standards to the public and all relevant stakeholders is necessary for not only public education, but also transparency.

Assess whether such a framework would give sufficient protection to the public to ensure that their data is not misused by future researchers.

(10 marks)

[Turn Over]

Section B
Answer Section B questions in Answer Book B

B4.

a) What is meant by an XML database and why is it often useful when building web applications? Give **FIVE** reasons for its use.

(8 marks)

b) Evaluate an architecture that is designed to protect a database server connected to a web application from external attack. What security issues need to be addressed to ensure the server is properly protected?

(7 marks)

c) Describe the principles of a SQL Injection attack. What data could be accessed by means of such an attack and how might this be prevented? Provide an example of such an attack, and how it can be prevented, with example code.

(10 marks)

B5.

a)

i) What does CSS stand for? Explain the **acronym**, and the **purpose** of this technology.

ii) Assess **THREE** distinct benefits brought by using CSS, as well as **ONE** limitation.

(9 marks)

b) You have been asked to prepare a specification for a web site to support **The Great Butterfly Hunt.** This is an annual event when members of the public are asked to spend fifteen minutes in their garden and count the numbers of each species of butterfly they see. You have been provided with suggested layouts for a number of the pages. To gain the contract to develop the final site you have been asked to provide a sample web site demonstrating how you will implement a common interface across the whole site that includes the following pages:

i) The Home Page butterfly_survey.html introduces the challenge. A suggested layout is shown in Figure B5.1 (page 10). You should assume the use of the css file that you develop in ii).

ii) An external css file butterfly.css which provides the features common across all pages.

iii) The changes you would need to make to butterfly_survey.html and butterfly.css to provide the information page on the Red Admiral butterfly (red_admiral.html) as illustrated in Figure B5.2 (page 10). Note that this includes an addition to the left-hand panel to return the user to the Home Page (butterfly_survey.html), and the addition of a footer that links to several social media and photographic sharing sites, so that recorders can share their sightings.

iv) An input page for participants to record their sightings (record.html). Again, you only need to provide the changes that you need to make to other files to provide this page, clearly stating where they are located. You should include the default entries shown in Figure B5.3 (page 11) but do not need to include code to transfer entries to the server.

You can assume the following images are available for your use in a directory `.\images` in your web page directory:

```
Peacock.jpg
Red_admiral.jpg
Small_tortoiseshell.jpg
```

The social media icons are obtainable from **font-awesome** and can be accessed with the following css:

```
https://cdnjs.cloudflare.com/.../css/font-awesome.min.css
```

They belong to class fa and their names:

```
fa-facebook-official
fa-instagram
fa-snapchat
fa-pinterest-p
fa-twitter
fa-linkedin
```

You do not need to provide any content for pages not specified in this question, but all the links should be provided, both within the site and externally.

Your code should be clearly commented to show how it meets the requirements.

(16 marks)

End of Examination

[Turn Over]