Tuesday 8 May 2018
2.00 pm – 3.00 pm
(Duration: 1 hour)

DEGREES of MSci, MEng, BEng, BSc, MA and MA (Social Sciences)

WEB APPLICATION DEVELOPMENT 2

This examination paper is worth a total of 90 marks.

For each multiple-choice question, a correct answer is worth 3 marks,
an incorrect answer will result in a deduction of 1 mark,
whilst an answer left blank equates to 0 marks.

Answer all questions

The use of a calculator is not permitted in this examination
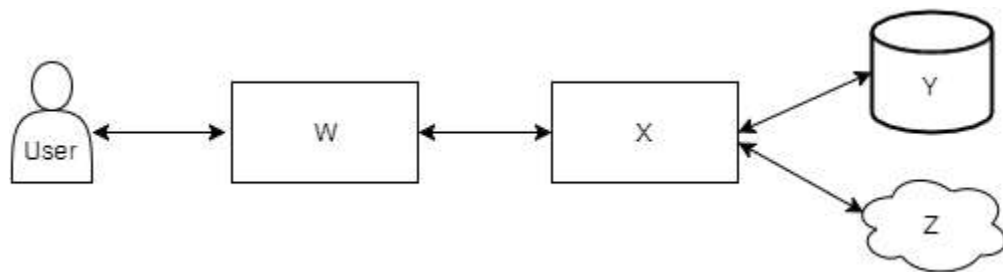
Section A   30 marks

1. What sequence of commands would you issue to upload and share your new source code in a GitHub repository? You can assume the added code won't cause a conflict with existing code.
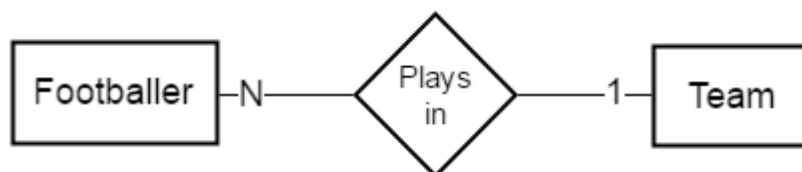
    A. push, commit, add, pull
    B. push, add, commit, pull
    C. pull, commit, push, add
    D. pull, add, commit, push

2. Consider the following system architecture diagram for a web application:

    What are the correct labels for W, X, Y and Z?

    A. W=Client, X=Middleware, Y=Database, Z=External Service
    B. W=Client, X=Server, Y=Database, Z=External Service
    C. W=Server, X=Database, Y=External Service, Z=Client
    D. W=Client, X=Middleware, Y=Database, Z=Server

3. Consider the following ER Diagram:

    Which one of the following lines should belong to the declaration of the Footballer model?

    A. `footballer = models.ManyToOneField(Team)`
    B. `footballer = models.ForeignKey(Footballer)`
    C. `team = models.ManyToOneField(Footballer)`
    D. `team = models.ForeignKey(Team)`

4.   Which of the following deliverables are the responsibilities of an Information Architect? Select the answer that best applies.

    A.   user personas, wireframes and templates
    B.   site maps, URL designs and Cascading Stylesheets
    C.   user personas, site maps and URL designs
    D.   system architecture diagrams, user needs matrices and usability testing

5.   Most web application frameworks make use of the Model View Controller Template (MVCT) architecture (or some variant of this). Which one of the following options best describes how Django implements the MVCT architecture?

    A.   Models are implemented using SQL commands that act directly on the database tables; Views are responsible for handling and processing specific requests; the Controller specifies which view should be called by pattern-matching a URL in views.py; Templates are responsible for rendering the data to be presented.

    B.   Models are implemented by an Object-Relational Mapping to actual database tables; Views are responsible for handling and processing specific requests; the Controller specifies which view should be called by pattern-matching a URL in urls.py; Templates are responsible for rendering the data to be presented.

    C.   Models are implemented using SQL commands that act directly on the database tables; Views are responsible for handling and processing specific requests; the Controller specifies which view should be called by pattern-matching a URL in urls.py; Templates that render the data to be presented are contained in views.py.

    D.   Models are implemented by an Object-Relational Mapping to actual database tables; Views are responsible for handling and processing specific requests; the Controller specifies which view should be called by pattern-matching a URL in views.py; Templates are responsible for rendering the data to be presented.

6.   DOM Parsing and SAX Parsing are two methods for parsing XML documents. Which of the following characteristics best describes DOM and SAX Parsing?

    A.   DOM is appropriate for using parts of the data, especially if there are memory constraints, whilst SAX is appropriate if you need the whole document.
    B.   DOM provides an event-driven parser, whilst SAX is appropriate if you need to move about the elements of the document freely.
    C.   DOM builds a hierarchical model of XML elements in memory, whilst SAX provides an event-driven parser.
    D.   DOM is appropriate for using parts of the data in the order they appear in the file, whilst SAX is appropriate if you need to move about the elements of the document freely.

7. Building web applications involves an array of challenges and complexities; these include:

   A. The hypertext structure, the demand by users for instant availability, the variety of devices and the different web frameworks.
   B. The variety of devices, the simplicity of the HTTP protocol and the composition of the development team.
   C. The lack of an accepted development methodology, the hypertext structure and the homogeneous user populations.
   D. The composition of the development team, the immature and legacy technologies and the low expectations of users.

8. Which one of the following options contains only valid URL schemes?

   A. https, file, image
   B. http, ftp, mailto
   C. telnet, news, rss
   D. http, file, video

9. Consider the following XML document:

   ```
   <employees>
       <employee>
           <firstName>John</firstName> <lastName>Doe</lastName>
       </employee>
       <employee>
           <firstName>Anna</firstName> <lastName>Smith</lastName>
       </employee>
   </employees>
   ```

   Which one of the following options gives the equivalent JSON representation?

   A. ["employees":[{"firstName":"John", "lastName":"Doe"},
                    {"firstName":"Anna", "lastName":"Smith"}]]

   B. {"employees":[["firstName":"John", "lastName":"Doe"],
                    ["firstName":"Anna", "lastName":"Smith"]]}

   C. {"employees":[{"firstName":"John", "lastName":"Doe"},
                    {"firstName":"Anna", "lastName":"Smith"}]}

   D. {"employees":{{"firstName":"John", "lastName":"Doe"},
                    {"firstName":"Anna", "lastName":"Smith"}}}

10. Consider the following form contained in a Django template:

```
<form action="{% url 'polls:vote' question.id %}"
      method="post">
  {% csrf_token %}
  {% for choice in question.choice_set.all %}
    <input type="radio" name="choice_var" id="choice
           {{ forloop.counter }}" value="{{ choice.id }}" />
    <label for="choice{{ forloop.counter }}">
           {{ choice.choice_text }}</label><br />
  {% endfor %}
  <input type="submit" value="Vote" />
</form>
```

When the form is submitted, an HTTP POST request will occur and a key-value pair will be transmitted as part of the message. Which of the following statements is true?

A. The key is "choice_var" and the value is an integer.
B. The key is "choice" and the value is "choice" concatenated with an integer.
C. The key is "choice_var" and the value is given by choice_text.
D. The key is "choice" and the value is an integer.

Section B

30 marks

The following HTML and CSS code applies to the next three questions:

```
<head>
  <style type="text/css">

    a { color: red;
        font-style: italic; }

    li a { color: green;
           font-weight: bold; }

  </style>
</head>
<body>
  <ul>
    <li> <a href="http://www.tangowithdjango.com">
         Tango with Django</a>
    <li> <a style="text-color: blue"
         href="http://www.w3schools.com">W3 Schools</a>
    <li> <a class="classref" style="font-style: normal"
         href="https://jquery.com/">jQuery</a>
  </ul>
</body>
```

11. How will the text "Tango with Django" be rendered? Choose the option that best applies.

    A.   red and italic
    B.   red, italic and bold
    C.   green and bold
    D.   green, italic and bold

12. How will the text "W3Schools" be rendered? Choose the option that best applies.

    A.   red and italic
    B.   green, italic and bold
    C.   blue and bold
    D.   blue, italic and bold

13. How will the text "jQuery" be rendered? Choose the option that best applies.

    A.   red and italic
    B.   green, italic and bold
    C.   green and bold
    D.   black

14. Consider the following HTML code:

```
<body>
    <div style="background-color: blue">League of Legends</div>
</body>
```

The CSS referencing is an example of which type of referencing?

A. inline referencing
B. embedded referencing
C. online referencing
D. external referencing

15. Consider the following JavaScript code:

```
// start of code segment 1
function point(xVal, yVal)
{  this.x = xVal;
    this.y = yVal;
}

var point1=new point(6, 8)
// end of code segment 1

// start of code segment 2
var point2 = new Object();
point2.x = 6;
point2.y = 8;
// end of code segment 2

// start of code segment 3
var point3 = {x:6, y:8};
// end of code segment 3
```

Which one or more of the code segments represents a valid way to create a point object in two dimensions with x-coordinate equal to 6 and y-coordinate equal to 8?

A. Code segment 1 creates the object successfully, whilst at least one of the other two code segments does not create the object successfully.
B. Code segment 2 creates the object successfully, whilst at least one of the other two code segments does not create the object successfully.
C. Code segment 3 creates the object successfully, whilst at least one of the other two code segments does not create the object successfully.
D. Each of the three code segments creates the object successfully.

16. Suppose that the following JavaScript function is stored in UpperCase.js:

```
function upcase(n)
{  if (n.nodeType == 3 /*Node.TEXT_NODE*/)
   {  n.nodeValue= n.nodeValue.toUpperCase();
   } else
   {  var kids = n.childNodes;
      for(var i = 0; i < kids.length; i++)
      {  upcase(kids[i]);
      }
   }
}
```

Suppose also that the following code is placed in the head of TestPage.html:

```
<script type="text/javascript" src="UpperCase.js"></script>
```

Now consider the following incomplete line of HTML code:

```
<script type="text/javascript">upcase(**)</script>
```

In order to turn all of the text in TestPage.html into upper case, what should ****** be replaced by, and where in TestPage.html should the above line of code be placed?

A. ****** should be `document.body` and the line of code should be placed at the end of the body of TestPage.html

B. ****** should be `document.text` and the line of code should be placed in the head of TestPage.html

C. ****** should be `document.body` and the line of code should be placed at the start of the body of TestPage.html

D. ****** should be `document.text` and the line of code should be placed at the start of the body of TestPage.html

17. Consider the following HTML, JavaScript and jQuery code:

```
<html>
   <head>
      <script type="text/javascript" src="jquery.js"></script>
      <script type="text/javascript" charset="utf-8">
         $(document).ready(function() {
            $("a").click(function() {
               alert("Hello World!");
            });
         });
      </script>
   </head>
   <body>
      <a href="">1st link</a><br><br>
      <a href="">2nd link</a>
   </body>
</html>
```

Assume that jquery.js is located in the same folder as the HTML file. Which one of the following statements best describes what happens when this page is loaded in a browser?

A. A message "Hello world" appears in the browser as soon as the page is loaded.
B. A pop-up dialog box containing the message "Hello world" appears in the browser as soon as the page is loaded.
C. A message "Hello world" appears in the browser when the user clicks on either of the hyperlinks.
D. A pop-up dialog box containing the message "Hello world" appears in the browser when the user clicks on either of the hyperlinks.

18. Consider the following HTML, JavaScript and jQuery code:

```
<html>
  <head>
    <script type="text/javascript" src="jquery.js"></script>
    <script type="text/javascript">
      $(document).ready(function() {
        $(".bigtext").hover(function() {
          $(this).animate({paddingLeft: '+=30px'}, 200);
        }, function() {
          $(this).animate({paddingLeft: '-=30px'}, 200);
        });
      });
    </script>

    <style type="text/css" media="screen">
      .bigtext { font-size: 400%; }
    </style>
  </head>

  <body>
    <a href="">1st link</a><br><br>
    <a href="" class="bigtext">2nd link</a>
  </body>
</html>
```

Assume that jquery.js is located in the same folder as the HTML file. Which one of the following options best describes what happens when the user moves the mouse cursor around the page when it is loaded in a browser?

A. Each of the links moves 30 pixels to the right when the mouse cursor hovers over it, and 30 pixels to the left when the mouse cursor leaves it.
B. The link with description "2nd link" moves 30 pixels to the right when the mouse cursor hovers over it, and 30 pixels to the left when the mouse cursor leaves it.
C. The link with description "1st link" moves 30 pixels to the left when the mouse cursor hovers over it, and 30 pixels to the right when the mouse cursor leaves it.
D. The link with description "2nd link" moves 30 pixels to the left when the cursor hovers over it, and 30 pixels to the right when the mouse cursor leaves it.

19. Consider the following XML document:

```
<?xml version="1.0"?>
<note id="milkReminder">
   <to>Bob</to>
   <From>Alice</From>
   <heading>Reminder</heading>
   <body>Don't forget to get milk!</body>
   <optional></optional>
</note>
```

Which one of the following statements is true? Choose the option that best applies.

A.   The document is well-formed.
B.   The document is not well-formed because some element is empty.
C.   The document is not well-formed because some element tag has upper case characters.
D.   The document is not well-formed because it has no root element and some element has upper and lower case characters.

20. Consider the following XML document:

```
<?xml version="1.0"?>
<to>Alice</to>
<from>Bob</from>
<heading>Reminder</heading>
<body> Don't forget to get milk!</body>
```
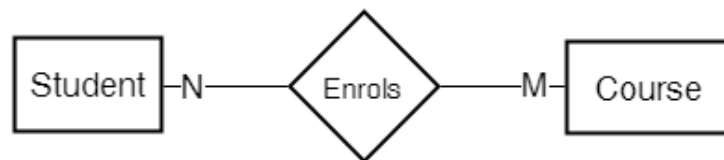
Which one of the following statements is true? Choose the option that best applies.

A.   The document is well-formed.
B.   The document is not well-formed because it has no root element.
C.   The document is not well-formed because it has no DTD.
D.   The document is not well-formed because it has no DTD and no root element.

Section C   30 marks

This section contains questions relating to the development of a web application entitled **app** for handling the enrolment of students onto courses. The models **Student** and **Course** are based on the following ER diagram:

The code in **app/models.py** is as follows:

```python
from django.template.defaultfilters import slugify
from django.db import models

class Student(models.Model):
    name = models.CharField(max_length=50)
    number = models.IntegerField(unique=True, default=0)
    def __str__(self):
        return self.name

class Course(models.Model):
    name = models.CharField(max_length=50)
    capacity = models.IntegerField(default=0)
    students = models.ManyToManyField(Student)
    slug = models.SlugField()
    def save(self, *args, **kwargs):
        self.slug = slugify(self.name)
        super(Course, self).save(*args, **kwargs)
    def __str__(self):
        return self.name
```

Now suppose that in **app/views.py**, there is a **show_student** view that is intended to handle the action of displaying the details about a given student, as follows:

```python
def show_student(request, student_number):
    context_dict = {}
    try:
        student = Student.objects.get(number=student_number)
        # See Question 21                                        (R1)
        context_dict['student'] = student
        context_dict['courses'] = courses
    except Student.DoesNotExist:
        context_dict['students'] = None
        context_dict['courses'] = None
    return render(request, 'app/student.html', context_dict)
```

21. Which one of the following lines of code should be inserted at point R1 above, in order to return the set of courses that a student has enrolled on?

```
A.    courses = student.course_set()
B.    courses = student.course_set.all()
C.    courses = student.courses
D.    courses = Course.objects.filter(student=student)
```

The following code applies to the next two questions. Consider the following URL mappings for **app**, which are contained in **app/urls.py**:

```
from django.conf.urls import url
from . import views

urlpatterns = [
    url(r'^$', views.index, name='index'),
    url(r'^about/$', views.about, name='about'),
    # To be completed for Question 22                      (R2)
    # To be completed for Question 23                      (R3)
]
```

22. Which one of the following lines of code should be inserted at point R2 above, to provide the URL mapping to the **show_course** view?

```
A.    url(r'^course/(?P<course_name>[a-z]+)/$',
              views.show_course, name='show_course'),
B.    url(r'^course/(?P<course_name_slug>[a-z]+)/$',
              views.show_course, name='show_course'),
C.    url(r'^course/(?P<course_name>[\w\-]+)/$',
              views.show_course, name='show_course'),
D.    url(r'^course/(?P<course_name_slug>[\w\-]+)/$',
              views.show_course, name='show_course'),
```

23. Which one of the following lines of code should be inserted at point R3 above, to provide the URL mapping to the **show_student** view?

```
A.    url(r'^student/(?P<student_number>[0-9]+)/$',
              views.show_student, name='show_student'),
B.    url(r'^student/(?P<student_name_slug>[\w\-]+)/$',
              views.show_student, name='show_student'),
C.    url(r'^student/(?P<student_number>[\w\-]+)/$',
              views.show_student, name='show_student'),
D.    url(r'^student/(?P<student_name_slug>[a-z]+)/$',
              views.show_student, name='show_student'),
```

The following code applies to the next two questions. The template below called **app/student.html** is intended to display the details about a given student:

```html
<html>
    <title>
        Viewing a student
    </title>
</head>
<body>
    {% if student %}
        <!-- see Question 24 -->                    (R4)
        {% if courses.count > 0 %}
            <ul>
                {% for course in courses.all %}
                    <!-- see Question 25 --> %}       (R5)
                {% endfor %}
            </ul>
        {% else %}
            <strong>This student has enrolled on no courses.
            </strong>
        {% endif %}
    {% else %}
        The specified student does not exist!
    {% endif %}
</body>
</html>
```

24. Which one of the following lines of code should be inserted at point R4 above, in order to display a student's name and number?

    A. `<h1>student.name</h1>`
        `<h2>Student number: student.number</h2>`
    B. `<h1>{ student.name }</h1>`
        `<h2>Student number: { student.number }</h2>`
    C. `<h1>{{ student.name }}</h1>`
        `<h2>Student number: {{ student.number }}</h2>`
    D. `<h1>%student.name</h1>`
        `<h2>Student number: %student.number</h2>`

25. Which one of the following lines of code should be inserted at point R5 above, in order to list the name of each course that the student has enrolled on, with a hyperlink to the **show_course** view (intended to handle the action of displaying the details about a given course) in each case?

    A. `<li><a href="{%url 'show_course' course.slug %}">`
            `{{ course.name }}</a></li>`
    B. `<li><a href="{%url 'show_course' course.slug %}">`
            `{{ course.slug }}</a></li>`
    C. `<li><a href="{%url 'show_course' course.name %}">`
            `{{ course.slug }}</a></li>`
    D. `<li><a href="{%url 'show_course' course.name %}">`
            `{{ course.name }}</a></li>`

The following code applies to the next two questions. Suppose that in **app/views.py**, there is an **add_course** view that is supposed to process the adding of a new course, as follows:

```python
def add_course(request):
    form = CourseForm()
    # To be completed for Question 26              (R6)
        if form.is_valid():
            # To be completed for Question 27      (R7)
            return index(request)
        else:
            print(form.errors)
    return render(request, 'app/add_course.html',
                            {'form': form})
```

26. Which one of the following lines of code should be inserted at point R6 above?

A. ```python
   if request.method == 'GET':
       form = CourseForm(request.GET)
   ```
B. ```python
   if request == 'GET':
       form = CourseForm(request.GET)
   ```
C. ```python
   if request.method == 'POST':
       form = CourseForm(request.POST)
   ```
D. ```python
   if request == 'POST':
       form = CourseForm(request.POST)
   ```

27. Which one of the following lines of code should be inserted at point R7 above?

A. ```python
   form.clean()
   ```
B. ```python
   form.save(commit=True)
   ```
C. ```python
   form.save(commit=False)
   ```
D. ```python
   form.commit()
   ```

28. The template **app/add_course.html** is responsible for displaying the form for adding details about a new course.

Which one of the following lines of code should be included in **app/add_course.html**?

A. ```html
   <form id="course_form" method="get"
    action="{% url 'add_course' %}">
   ```
B. ```html
   <form id="course_form" method="get"
    action="{% url 'show_course' %}">
   ```
C. ```html
   <form id="course_form" method="post"
    action="{% url 'add_course' %}">
   ```
D. ```html
   <form id="course_form" method="post"
    action="{% url 'show_course' %}">
   ```

29. The next task is to create a form for adding a new course. This form is called **CourseForm** and it resides in **app/forms.py**. Which one of the following lines of code should belong to the class **CourseForm**?

    A.   `slug = forms.SlugField()`
    B.   `slug = forms.CharField()`
    C.   `slug = forms.SlugField(required=False)`
    D.   `slug = forms.SlugField(widget=forms.HiddenInput(), required=False)`

30. The template **app/course.html** is responsible for displaying information about a given course. Part of this is shown as follows:

```
<body>
    {% if course %}
        <!-- display the course name and capacity -->
        <!-- (code to do this has been omitted)  -->
        {% if students.count > 0 %}
            <ul>
                {% for student in students.all %}
                    <!-- To be completed for Q 30 -->      (R8)
                {% endfor %}
            </ul>
        {% else %}
            <strong>No students have enrolled on this course.
            </strong>
        {% endif %}
    {% else %}
        The specified course does not exist!
    {% endif %}
</body>
```

Which of the following lines of code should be inserted at point R8 above in order to list the name of each student enrolled on the course, with a hyperlink to the **show_student** view in each case?

    A.   `<li><a href="{%url 'show_student' student.slug %}">`
         `        {{ student.name }}</a></li>`
    B.   `<li><a href="{%url 'show_student' student.number %}">`
         `        {{ student.slug }}</a></li>`
    C.   `<li><a href="{%url 'show_student' student.name %}">`
         `        {{ student.slug }}</a></li>`
    D.   `<li><a href="{%url 'show_student' student.number %}">`
         `        {{ student.name }}</a></li>`