

# **ICT239**

**End-of-Course Assessment - January Semester 2023**

## **Web Application Development**

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### **INSTRUCTIONS TO STUDENTS:**

1. This End-of-Course Assessment paper comprises **9** pages (including the cover page).
2. You are to include the following particulars in your submission: Course Code, Title of the ECA, SUSS PI No., Your Name, and Submission Date.
3. Late submission will be subjected to the marks deduction scheme. Please refer to the Student Handbook for details.

### **IMPORTANT NOTE**

**ECA Submission Deadline: Sunday, 21 May 2023 12:00 pm**

## **ECA Submission Guidelines**

Please follow the submission instructions stated below:

This ECA carries 70% of the course marks and is a compulsory component. It is to be done individually and not collaboratively with other students. Submission You are to submit the ECA assignment in exactly the same manner as your tutor-marked assignments (TMA), i.e. using Canvas. Submission in any other manner like hardcopy or any other means will not be accepted.

Electronic transmission is not immediate. It is possible that the network traffic may be particularly heavy on the cut-off date and connections to the system cannot be guaranteed. Hence, you are advised to submit your assignment the day before the cut-off date in order to make sure that the submission is accepted and in good time. Once you have submitted your ECA assignment, the status is displayed on the computer screen. You will only receive a successful assignment submission message if you had applied for the e-mail notification option.

### **ECA Marks Deduction Scheme**

Please note the following: a) Submission Cut-off Time – Unless otherwise advised, the cut-off time for ECA submission will be at 12:00 noon on the day of the deadline. All submission timings will be based on the time recorded by Canvas. b) Start Time for Deduction – Students are given a grace period of 12hours. Hence calculation of late submissions of ECAs will begin at 00:00 hrs the following day (this applies even if it is a holiday or weekend) after the deadline. c) How the Scheme Works – From 00:00 hrs the following day after the deadline, 10 marks will be deducted for each 24-hour block. Submissions that are subject to more than 50 marks deduction will be assigned zero mark. For examples on how the scheme works, please refer to Section 5.2 Para 1.7.3 of the Student Handbook. Any extra files, missing appendices or corrections received after the cut-off date will also not be considered in the grading of your ECA assignment.

### **Plagiarism and Collusion**

Plagiarism and collusion are forms of cheating and are not acceptable in any form of a student's work, including this ECA assignment. You can avoid plagiarism by giving appropriate references when you use some other people's ideas, words or pictures (including diagrams). Refer to the American Psychological Association (APA) Manual if you need reminding about quoting and referencing. You can avoid collusion by ensuring that your submission is based on your own individual effort. The electronic submission of your ECA assignment will be screened through a plagiarism detecting software. For more information about plagiarism and cheating, you should refer to the Student Handbook. SUSS takes a tough stance against plagiarism and collusion. Serious cases will normally result in the student being referred to SUSS's Student Disciplinary Group. For other cases, significant marking penalties or expulsion from the course will be imposed.

(Full marks: 100)

### **Question 1**

Question 1 concerns the BMI case study.

Analyze the code in the BMI case study concerning the BMI chart based on the following description:

- The BMI chart is drawn through myChart\_CSV2.js, which is loaded via bmi\_chart2.html in the frontend.
- Upon being loaded, it triggers an AJAX call (HTTP POST) to the backend handled by the route /chart2 in the controller code dashboard.py.
- The route /chart2 in turn retrieves data from the model implemented on MongoDB, and defined in BMIDAILY.py.

#### **Question 1a**

Two models are defined for recording BMI data: BMIDAILY and BMILOG, defined in BMIDAILY.py and BMILOG.py respectively. Compare and contrast the two models.

(8 marks)

#### **Question 1b**

Using the Input-Processing-Output (IPO) structure, describe the input to the route /process in bmi.py whereby user input is captured, the processing resulting in the storage of data in the models defined in BMIDAILY.py and BMILOG.py, and the output of the route /process. Explain also how the call to the route /process is made and purpose of the call.

(10 marks)

#### **Question 1c**

Compare and contrast the processing of data in the routes /process and /upload.

(6 marks)

#### **Question 1d**

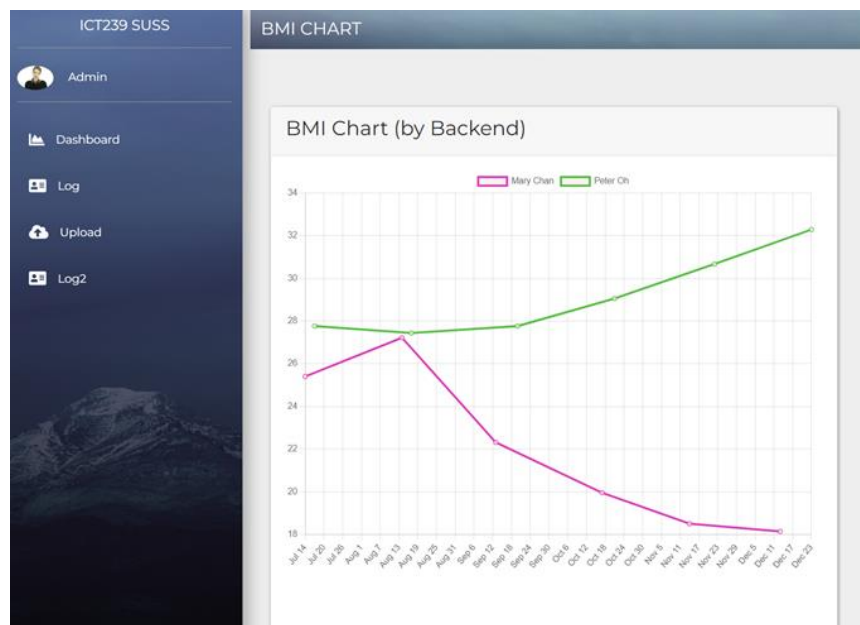
Apply and re-implement the route /upload in app.py and /chart2 in dashboard.py such that

- there is no need for the BMIDAILY class in the re-implementation. Therefore, there is no collection for BMIDAILY entries in MongoDB.
- the route /upload reads a new input file “DataSet2.1.csv” and stores the data into BMILOG entries. The content of the csv file is as follows:

```
User_email,Date,Weight,Height,Unit
poh@abc.com,2022-07-17 13:55:26,86,176,cm
poh@abc.com,2022-08-17 13:55:26,85,176,cm
poh@abc.com,2022-09-20 13:55:26,84,176,cm
poh@abc.com,2022-09-20 14:55:26,88,176,cm
poh@abc.com,2022-10-21 13:55:26,90,176,cm
poh@abc.com,2022-11-22 13:55:26,95,176,cm
poh@abc.com,2022-12-23 13:55:26,100,176,cm
mchan@abc.com,2022-07-14 13:55:26,70,166,cm
mchan@abc.com,2022-08-14 13:55:26,75,166,cm
mchan@abc.com,2022-09-13 13:55:26,63,166,cm
mchan@abc.com,2022-09-13 14:55:26,60,166,cm
mchan@abc.com,2022-10-17 13:55:26,55,166,cm
mchan@abc.com,2022-11-14 13:55:26,51,166,cm
mchan@abc.com,2022-12-13 13:55:26,50,166,cm
```

- The route /chart2 retrieves data from the BMILOG model instead of BMIDAILY model to plot the same chart.

Figure Q1(d) shows the chart with the data uploaded from DataSet2.1.csv.



**Figure Q1(d)**

### Question 1d(i)

Apply and re-implement the route /upload to read a new input file “DataSet2.1.csv”  
(8 marks)

### Question 1d(ii)

Re-implement the route /chart2 to retrieve data from the BMILOG model (without using the BMIDAILY model) and demonstrate the data by plotting the same chart.

Remove the entries in both BMIDAILY and BMILOG collections, and then test your implementation of the route /upload followed by /chart2.

(8 marks)

## Question 2

Questions 2 and Question 3 continue the TMA theme on the development of the web application for golfers to keep track of their golf sets and swings.

Figure. Q2(a)(i) shows the admin's view after logging in, and Figure. Q2(a)(ii) shows a non-admin user's view. The Get Club Advice function is available only to non-admin user. The new function, Get Club Advice allows a non-admin user to discover which clubs to use to hit a golf ball at a swing speed to move the ball by a desired distance.

Note that the icon `fa-circle-question` for Get Club Advice function provided by fontawesome.com will show a symbol within a circle, and the symbol alternates between “?” and “!”.

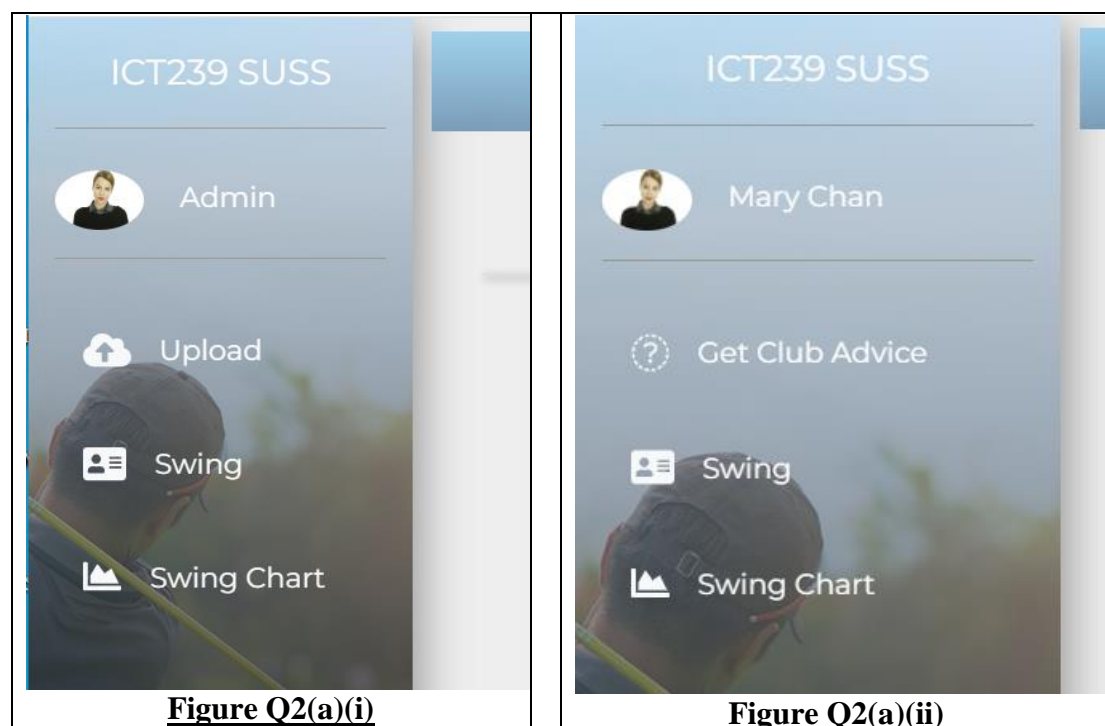


Figure Q2(b) shows the view when the Get Club Advice link is clicked on. The Golf Club Advisor's Swing Speed field and the Distance field are both required. The non-admin user must enter a value representing the swing speed that he will use to hit a golf ball, and a value for the distance he desires the golf ball to move. When the Submit button is clicked, a request will be sent to the backend.

**Figure Q2(b)**

The backend computes the estimated distance moved (in yards) using the same formula given in the TMA, for each club in the non-admin's golf set are used.

```
estimated_distance = (280 - abs(48- club_length)*10 - abs(club_head_loft - 10)*1.25) * swingSpeed/96
```

```
club_length = club_head_height + shaft_length
```

```
club_head_height = club_head_size/400 for WoodHead
                  1 for IronHead
                  1 for Blade style and 0.5 otherwise for PutterHead
```

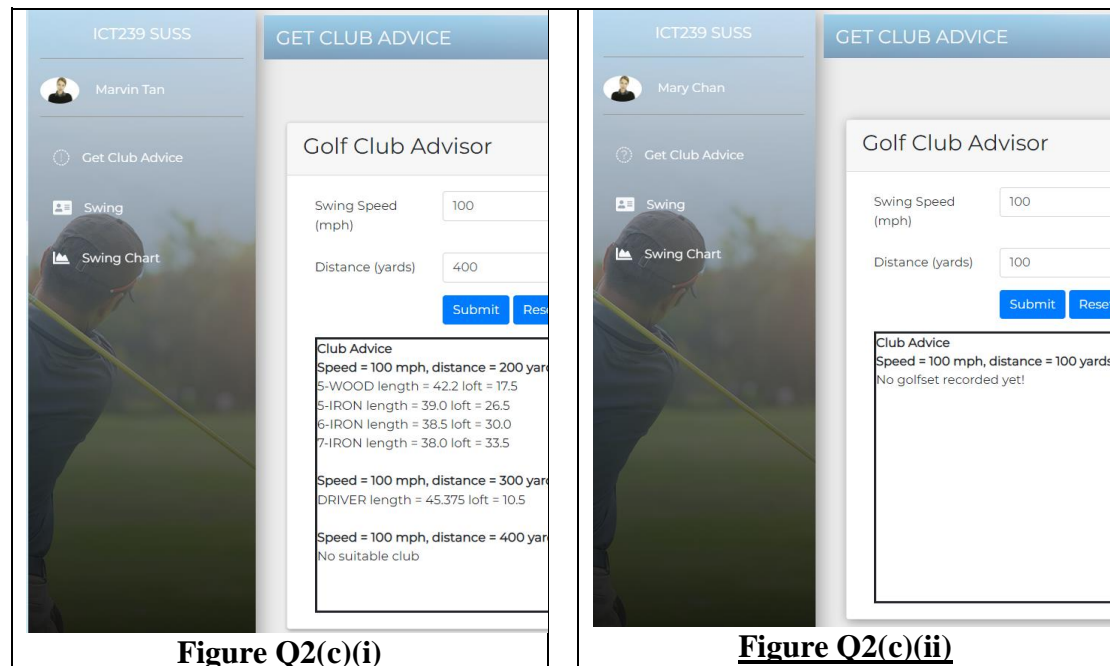
The backend then computes the difference between the estimated distance and the desired distance that was entered in Golf Club Advisor's Distance field. If the difference is  $\pm \text{delta}$ , then the club used to compute the estimated distance can be used to hit the golf ball. You can assume  $\text{delta}$  has a default value of 50 yards.

Figure Q2(c)(i) shows the outcome of interaction for user Marvin Tan (email: [marvin@abc.com](mailto:marvin@abc.com), password: 12345) with these clubs in his golf set:

```
DRIVER,Wood,10.5,203,450,44.25,68,Graphite,R,0.6,62,Rubber
5-WOOD,Wood,17.5,240,280,41.5,85,Graphite,R,0.6,62,Rubber
5-IRON,Iron,26.5,262,Cast,38.0,102,Steel,S,0.6,62,Rubber
6-IRON,Iron,30.0,264,Cast,37.5,104,Steel,S,0.6,62,Rubber
7-IRON,Iron,33.5,266,Cast,37.0,106,Steel,S,0.6,62,Rubber
8-IRON,Iron,37.0,268,Cast,36.5,108,Steel,S,0.6,62,Rubber
9-IRON,Iron,40.5,270,Cast,36.0,110,Steel,S,0.6,62,Rubber
PW,Iron,45.0,270,Cast,35.75,112,Steel,S,0.6,62,Rubber
GW,Iron,50.0,270,Cast,35.5,113,Steel,S,0.6,62,Rubber
SW,Iron,54.0,270,Cast,35.25,114,Steel,S,0.6,62,Rubber
LW,Iron,58.0,270,Cast,35.0,115,Steel,S,0.6,62,Rubber
ODYSSEY#7,Putter,3.0,365,Mallet,34.0,120,Steel,S,0.6,62,Rubber
```

For the first set of input values 100 and 200 into the Swing Speed and Distance fields respectively and clicking on the Submit button, 4 clubs are found to be suitable. For the second set of values 100 and 300, only 1 club is found, and for the last set of values 100 and 400, no suitable club can be found.

If a non-admin user (e.g., Mary Chan, email: [mchan@abc.com](mailto:mchan@abc.com), password:12345) does not have a golf set uploaded yet, then upon clicking on the Submit button after values are entered into the data fields, an error message will be displayed indicating that no golf set has been recorded yet.



If the Reset button is clicked, the fields as well as the output are cleared and the view reverts to the one shown in Figure Q2(b).

## Question 2a

Implement the frontend component(s) for the Get Club Advice view for the non admin users. Explain the purpose of each component, that is, why they are needed in your implementation.

(8 marks)

## Question 2b

Employ web programming framework and implement the **backend** component(s) for the Get Club Advice function. The implementation should be for single-paged application, that is, do not reload the components in Q2(a).

Explain the purpose of each component, that is, why they are needed in your implementation.

(15 marks)

### Question 2c

Implement the **frontend** component(s) to achieve the **interactivity** for the Get Club Advice function. The implementation should be for single-paged application, that is, do not reload the components in part Q2(a). Please use Javascript Ajax call.

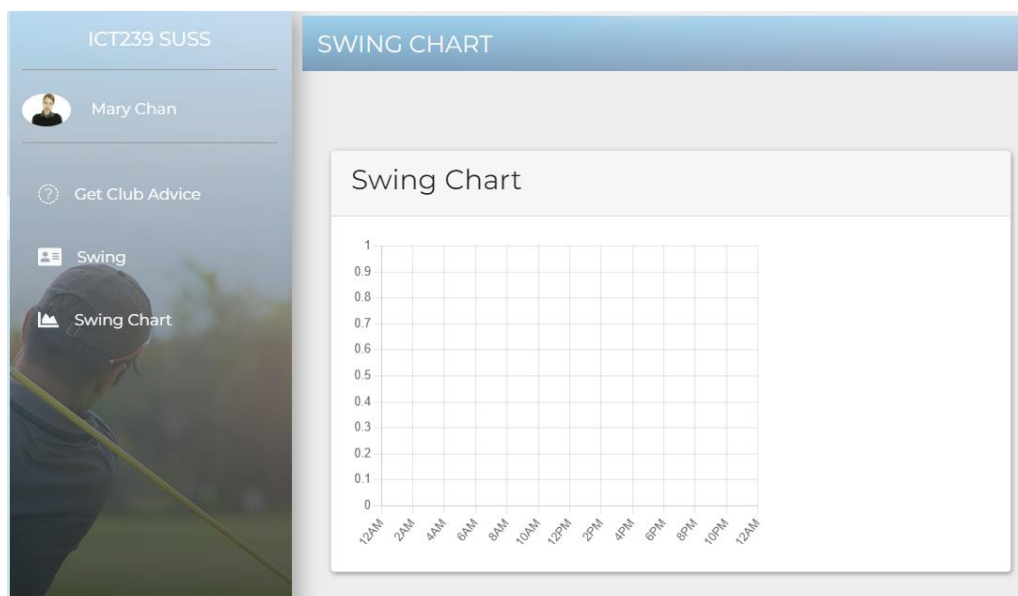
Explain the purpose of each component, that is, why they are needed in your implementation.

(12 marks)

### Question 3

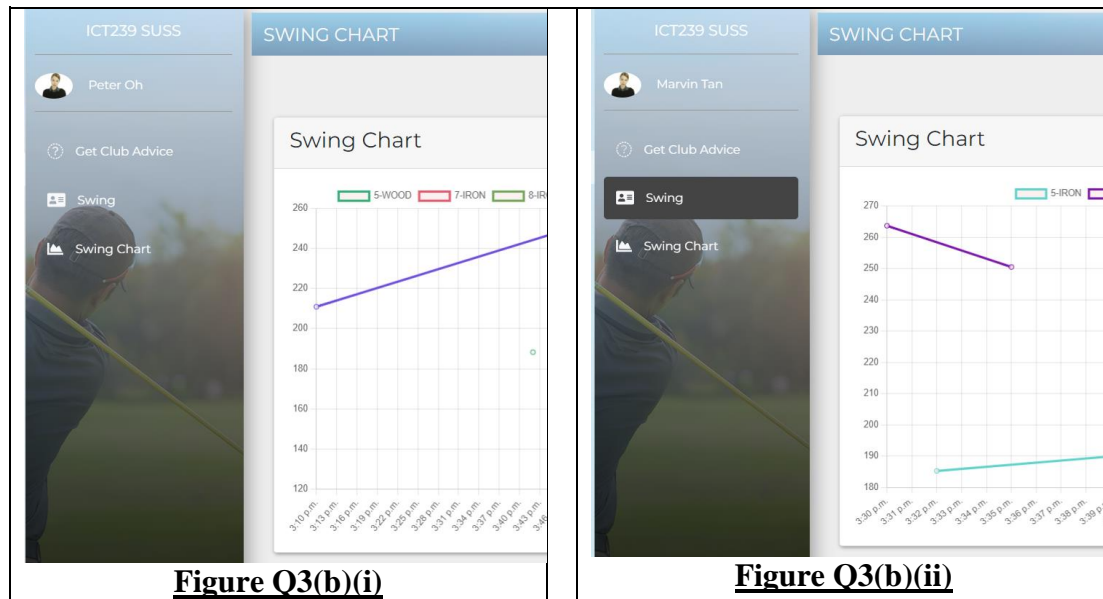
In the TMA implementation of the Swing Chart function for non-admin user, a chart shows a single line graph for all the swings made for the non-admin user if he has recorded at least a swing. In this new implementation, you are to make a line graph for each club for which at least a swing has been made. Note that this implementation affects only the non-admin user. The Swing Chart function for the admin user is unchanged.

Figure Q3(a), Figure Q3(b)(i) and Figure Q3(b)(ii) show the views after the Swing Chart link has been clicked. Figure Q3(a) shows the non-admin's view who has no swing recorded. Figure Q3(b)(i) and Figure Q3(b)(ii) show non-admin users' views for which swings have been recorded. Note that line graphs will show up only for clubs used in swings made by the current non-admin user.



**Figure Q3(a)**





### Question 3a

List all the components related to your implementation of the Swing Chart function in your TMA and indicate whether the component must be modified. You should provide justification for each component why it must or need not be modified.

(12 marks)

### Question 3b

Experiment, implement and highlight the changes in the components for the new Swing Chart function for non-admin user. Explain the changes.

(13 marks)

----- END OF ECA PAPER -----