UNIVERSITY OF LONDON

CM2040

BSc EXAMINATION

COMPUTER SCIENCE

Databases, Networks and the Web

Release date: Wednesday 14 September 2022 at 12:00 midday British Summer Time

Submission date: Thursday 15 September 2022 by 12:00 midday British Summer Time

Time allowed: 24 hours to submit

INSTRUCTIONS TO CANDIDATES:

Section A of this assessment paper consists of a set of **TEN** Multiple Choice Questions (MCQs) which you will take separately from this paper. You should attempt to answer **ALL** the questions in Section A. The maximum mark for Section A is **40**.

Section A will be completed online on the VLE. You may choose to access the MCQs at any time following the release of the paper, but once you have accessed the MCQs you must submit your answers before the deadline or within 4 hours of starting, whichever occurs first.

Section B of this assessment paper is an online assessment to be completed within the same 24-hour window as Section A. We anticipate that approximately **1 hour** is sufficient for you to answer Section B. Candidates must answer **TWO** out of the THREE questions in Section B. The maximum mark for Section B is **60**.

Calculators are not permitted in this examination. Credit will only be given if all workings are shown.

You should complete **Section B** of this paper and submit your answers as **one document**, if possible, in Microsoft Word or PDF to the appropriate area on the VLE. Each file uploaded must be accompanied by a coversheet containing your **candidate number** written clearly at the top of the page before you upload your work. Do not write your name anywhere in your answers.

UL22/1062

SECTION A

Candidates should answer the **TEN** Multiple Choice Questions (MCQs) quiz, **Question 1** in Section A on the VLE.

SECTION B

Candidates should answer any **TWO** questions from Section B.

Question 2

In your new job as a backend developer for keepfitgyms.com - a chain of leisure centres - you are responsible for implementing a MySQL database system. Your task is to design and develop a web application allowing users to do the following:

- Setup a **member** profile with standard information such as membership id, firstname, surname, email, password, etc.
- Purchase a **subscription** for a particular leisure centre by choosing from a range of subscription types. These will have extra attributes such as a renewal date, status and a list of facility types included in the subscription.
- Make a **booking** for a specific time for a **facility** at a specific **leisure centre**.

(a) For the keepfitgyms.com database, create an Entity Relationship Diagram using crow's foot notation (as covered in this module). Entities, relationships between entities, and appropriate association types should all be included in your diagram. [10]

(b) For each table of the database you designed in part (a), list the primary and foreign keys. [4]

(c) Using the appropriate SQL code write commands to create two of the tables you mentioned in your answer to part (a). To gain maximum points include all of the relevant fields and specify each as accurately as possible. [12]

(d) How could you design your database schema to ensure that each member only holds a single subscription? [4]

Question 3

Consider the database below for the famous insurance company Mostlyreliable.com. Each line shows a table with its properties, TableName (column1, column2, ...), and the primary keys and foreign keys are underlined. For example, 'policy_id' is the PRIMARY KEY of Policies and 'customer_id' is a FOREIGN KEY.

Customers (customer_id, name, address)
Policies (policy_id, policy_type, customer_id, expiry_date)
Claims (claim_id, policy_id, amount, type, status)

For each answer in this question you must include a short but complete explanation of how your SQL command works (NB. unexplained aspects of the command will not be awarded points).

Your answers must also be presented in a cut and pasteable format as we will be running your commands to mark them.

(a) In a controversial new company policy, Mostlyreliable.com no longer covers claims of type "accidental loss". Write an SQL command which updates all claims whose status is not "resolved" or "rejected" to have status of "rejected". [4]

(b) Statutory regulations require that Mostlyreliable.com must inform any customers who have been affected by its recent drastic policy change.

Using an appropriate SQL JOIN statement, display the claim_ids, policy_ids for all claims of type "accidental loss" together with the associated customer_ids. [4]

(c) The customer 'Jamilla Jessop' is being audited by Mostlyreliable.com for suspicious claim activity. Write an SQL statement to find the number of rejected claims for Ms Jessop. [8]

(d) It is time to calculate the annual no claim bonuses for Mostlyreliable.com's customers. Write an SQL command using the appropriate JOIN to return a list of customer ids who are due a no claims bonus.

Hint: You will need the "IS NULL" operator to check for NULL values. [6]

(e) In yet another sudden change of company policy only "silver" and "gold" policies will receive no claims bonuses. We will therefore need to inform all of those "bronze" policy holders who were previously due a no claims bonus.

Modify the command from part (c) to return only the customers with "bronze" policies. Then expand the command to return the full customer and policy data so that we can contact them.

Hint: You will need to use both LEFT and RIGHT joins to do this. [8]

Question 4

You have just started as the sole full-stack developer for an exciting new start up “Abs App” who are developing a fitness tracker. Your job is to develop the MVP (minimum viable product) using the ExpressJS framework and MySQL. The MVP will allow users to set up accounts and store workout routines.

(a) Write an EJS template file for creating a user account named create-user.ejs. This should include an HTML form with username, email and password. On submission the form should post the form data to a route called ”create-user.” (NB. as this is an MVP there is no need for styling or extra features, you will be marked on the core functionality only) [7]

(b) Write some code for the route named ‘create-user’ that has the following functionality:

- Retrieves username, email and password from the request
- Stores the above data as record in the SQL database (assume that there is a global variable for the mysql database connection)
- Your code should handle an error condition where the database query fails
- Your code should display a message once the new user is successfully created.

Include full explanatory comments for each part of your code. You must explain each part of the code adequately to score points. [10]

(c) Write a ‘workouts’ route which will query the database to retrieve all of the workout routines for a given user and then render them in an ejs template file called ‘workouts.ejs.’ NB. you don’t need to write the template file, but just make sure that you provide all the data that it needs.
Include full explanatory comments for each part of your code. You must explain each part of the code adequately to score points. [5]

(d) Whilst recognising that this version of the app is an MVP, the CEO wants to understand the work required to bring it up to Beta. They have asked for an audit of your code so far. Write a bulleted list of four weaknesses / vulnerabilities in terms of security, robustness, accessibility, and useability with a proposed solution for each. [8]

END OF PAPER