UNIVERSITY OF LONDON

CM2040

BSc EXAMINATION

COMPUTER SCIENCE

MOCK EXAM

Databases, Networks and the Web

September 2020: date and time to be confirmed

INSTRUCTIONS TO CANDIDATES:

This examination paper is in two parts: Part A and Part B. You should answer **ALL** of question 1 in Part A and **TWO** questions from Part B. Part A carries 40 marks, and each question from Part B carries 30 marks. If you answer more than **TWO** questions from **Part B** only your first **TWO** answers will be marked. You should ensure any additional answers or notes are deleted from the work you submit.

The marks for each part of a question are indicated at the end of the part in [.] brackets. There are 100 marks available on this paper.

Calculators are not permitted in this examination.

Please note that this is a mock exam. In September 2020, the University of London exams will not be taken at exam centres. Instead, they will be taken online. The details of how the exam will run have not yet been finalised. However, this mock exam will give you a good idea of the type of questions you can expect in the actual exam, if not the exact technical mode of delivery.

The precise details will be communicated in due course.

PART A

Candidates should answer **ALL** of Question 1 in Part A.

Question 1

(a) Which of the following best illustrates a "web application"?

Choose ONE option. [4]

i. A web application has a lower risk of data loss compared to a desktop application

ii. A web application is a computer program which allows a user to submit and retrieve data to/from a database over the internet using their preferred browser

iii. A web application is a software application with access to a database to perform CRUD operations

iv. A web application is a software application in which all or some parts of the software are downloaded from the web each time it is run and multiple updates are required for it.

(b) Which of the following best list basic components of a web server architecture?

Choose ONE option. [4]

i. Hardware, operating system, HTTP server, and scripting language

ii. Hardware, index.js and HTTP server

iii. Node.js, Express and JavaScript

iv. Database and relational database management system (RDBMS).

(c) Which of the following is a correct statement in the context of HTTP request methods?

Choose ONE option. [4]

i. POST requests data and GET submits data to be processed in an HTML form

ii. POST requests data and form data is sent to the server in the URL

iii. GET requests data and form data is sent to the server in the URL

iv. GET submits data to be processed and form data is sent to the server in the body of the request.

(d) Consider the employee database below, where the primary keys and foreign keys are underlined. Which of the following best describes the purpose of writing this SQL query: “UPDATE employee SET street = 'New cross street' WHERE person_name= 'Mark Patel'?

employee (person_name, street, city)
works (person_name, company_name, salary)
company (company_name, city)

Choose ONE option. [4]

i. Updating a record related to an employee named 'Mark Patel' who has changed his address
ii. Updating street and city fields of a record in employee table related to an employee named 'Mark Patel'
iii. Updating address fields of a company in the company table in which an employee named 'Mark Patel' works
iv. Updating address fields of a record in company table related to an employee named 'Mark Patel'.

(e) What is the output of this SQL query statement based on the 'Fruits' table below?
SELECT Fruits.product_name FROM Fruits WHERE Fruits.supplierID = 3;

Fruits table:

productID	product_name	supplierID	price
1	Lettuce	2	0.75
2	Apple	3	1.25
3	Peach	1	2.00

Choose ONE option. [4]

i. Apple
ii. 1.25
iii. Peach
iv. 2.00

(f) What is the purpose of a junction (or bridge) table in an entity-relationship diagram or a database schema?

Choose ONE option. [4]

i. To provide a unique identifier for a table
ii. To solve the issues associated with relational databases
iii. To solve the issues associated with the many-to-many association
iv. To reference one column in a table to another column in the second table.

(g) What is the output of this SQL query based on tables below named 'Fruits' and 'Suppliers'?

SELECT product_name, supplier_name FROM Fruits JOIN Suppliers ON Fruit.supplierID = Suppliers.ID WHERE Fruits.price < 1.0;

Please note the 'supplierID' column in the 'Fruits' table is a foreign key to the 'ID' column in the 'Suppliers' table.

Fruits Table

productID	product_name	supplierID	Price
1	Lettuce	2	0.75
2	Apple	3	1.25
3	Peach	1	2.00

Suppliers Table

ID	Supplier_name
1	Best Fruit and Veg
2	Veggie Veggie
3	Healthy eating

Choose ONE option. [4]

i. Apple, Healthy eating
ii. Lettuce, Veggie Veggie
iii. Peach, Best Fruit, and Veg
iv. Lettuce, Veggie Veggie, Apple, Healthy eating, Peach, Best Fruit, and Veg

(h) Which of the following is TRUE comparing packet-switching with circuit-switching technology?

Choose ONE option. [4]

i. Packet-switching provides better bandwidth utilization than circuit-switching technology
ii. Packet-switched networks require dedicated point-to-point connections during the connection
iii. Packet switching divides messages up into arbitrary packets with routing decisions made per-message
iv. Circuit-switching is the foundation of the Internet.

(i) What is SQL injection?

Choose ONE option. [4]

i. SQL injection is the placement of code in SQL statements to provide security
ii. SQL injection is the placement of code in SQL statements to provide database integrity
iii. SQL injection is the placement of malicious code in SQL statements, via a web page input
iv. SQL injection is the placement of malicious code in SQL statements, via a web page output.

(j) Which one of the following application types is most appropriately implemented by Node.js?

Choose ONE option. [4]

i. CPU intensive applications
ii. I/O intensive applications
iii. Live video encoding applications
iv. Video manipulation services.

PART B

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

Question 2

You are a freelance backend developer responsible for implementing a database for the 'online book store', for which you were given below information, where each line shows a table with its properties, *TableName (column1, column2, ...)*, and the primary and foreign keys are underlined. The first column in each table is a primary key and other underlined column names are foreign keys referring to the column with the same name in another table. As an example, 'customerID' in the 'Orders' table is a foreign key referring to the primary key 'customerID' in the 'customer' table. The web application is to be implemented using the MySQL Database Management System (DBMS).

Book (bookID, title, price, ISSN, publication_year, condition)
Customer (customerID, name, address)
Inventory (inventoryID, bookID, stocklevelUsed, stockLevelNew)
Orders (orderID, customerID, orderDate, total, shipping)
OrderItem (orderitemID, orderID, bookID, quantity, price)

(a) Draw an Entity-Relationship (ER) diagram for the 'online book store' database. Your diagram should include entities and relationships between entities and suitable association types. [10]

(b) The database model suggested above is incomplete. It should be possible to add author and publisher data. Describe how you would modify and/or extend the database model described above and the ER diagram drawn in part (a) to include author and publisher data. [4]

(c) Write the queries you would use to insert data in your database. If applicable, include the queries you would need to run before being able to insert the data. Use dummy data provided in the following table as initial stock for your bookstore. [10]

bookID	title	authorID	publisherID	publication_year	condition	price
879	Great Expectation	123	98	1861	used	60
658	Oliver Twist	123	45	1837	used	55

(d) Write one or more queries to retrieve all books published in 1861 which are currently in stock. [6]

Question 3

You are a freelance backend developer responsible for implementing a database for the 'online book store', for which you were given below information, where each line shows a table with its properties, *TableName (column1, column2, ...)*, and the primary and foreign keys are underlined. The first column in each table is a primary key and other underlined column names are foreign keys referring to the column with the same name in another table. As an example, 'customerID' in the 'Orders' table is a foreign key referring to the primary key 'customerID' in the 'customer' table. The web application is to be implemented using the MySQL Database Management System (DBMS).

Book (bookID, title, price, ISSN, publication_year, condition)
Customer (customerID, name, address)
Inventory (inventoryID, bookID, stocklevelUsed, stockLevelNew)
Orders (orderID, customerID, orderDate, total, shipping)
OrderItem (orderitemID, orderID, bookID, quantity, price)

a) Explain the purposes of a primary key and a foreign key with examples from the above database. [6]

b) Write a SQL JOIN statement that finds total amounts of orders ordered by a customer named 'Chloe Khan'. [7]

c) Write a SQL statement to find the name of the customers whose total orders are more than Chloe Khan's orders. [10]

d) Write a SQL statement to update the Inventory table when a customer places an order of a 'used' book with a bookID of 110. [7]

Question 4

You are in the process of building a web application for an online charity shop. You have written a script with a route that deletes an item from the database as follows:

```
1.app.post('/itemdeleted', function (req,res) {
2.          let squery = "DELETE FROM items WHERE itemID = ?";
3.          console.log (squery);
4.         let rec = [req.body.id];
5.          db.query(squery, rec, (err, result) => {
6.             if (err) {
7.               return console.error(err.message);
8.             }
9.             else
10.           res.render('itemdeleted.ejs', {msg:result});
11.           });
12.       });
```

a) Which line of code accesses a template file? How do you know it is this line? [4]

b) What is 'Separation of Concerns' (SoC) principles of programming? How is templating related to SoC? [8]

c) Which line of code passes a variable from middleware to the front-end? How do you know it is this line and what is the name of the variable passed? [6]

d) The charity shop is going to have a sale on all items, changing the prices of all items to £3. Write a piece of code as a 'sale' page to correct all prices in the database and display a message on the successful completion of database change. Please note, you are required to write the middleware code and not the template file. [12]

END OF PAPER