

UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

Department of Computing

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IS52027B

Data Networks and the Web

Duration: 3 hours

Date and time:

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*This paper is in two parts: part A and part B. You should answer ALL questions from part A and THREE questions from part B. Part A carries 40 marks, and each question from part B carries 20 marks. 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.*

*No calculators should be used.*

**THIS PAPER MUST NOT BE REMOVED  
FROM THE EXAMINATION ROOM**

**Part A**  
Multiple choice

**Question 1** This question has one correct answer

What is SQL?

[1]

- A. Standard Query Language: a standardised query language understood by all database management systems.
- B. Structured Query Language: a special-purpose language commonly used to manage data held in relational databases.
- C. Specialised Query Library: a software library written specifically for web applications to interact with databases.
- B. Sun Query Library: a software library originally developed by Sun Microsystems for interacting with relational databases.

**Question 2** This question has one correct answer

Relational database management systems mainly use row-based data storage. This makes them more suitable for which of the following tasks?

[1]

- A. Queries affecting many different records
- B. Reporting on a large data set
- C. Analysing relationships between entities in a database
- D. Queries affecting a single record

**Question 3** This question has one correct answer

What is the main reason why a Single Point of Entry might be advantageous in a database-driven web application?

[1]

- A. It may reduce development time by easing centralised tasks such as database connection and session handling as only one file will need to be modified.
- B. It will improve performance of the application as all the requests will be served by a single script.
- C. It will improve security as users will not be able to see which scripts are being loaded in the URL.
- D. It will improve performance by preventing multiple connections being opened on the database.

**Question 4** This question has one correct answer

What is the underlying protocol which defines how data is formatted and transmitted across the World Wide Web?

[1]

- A. Hyper-Text Transfer Protocol
- B. Secure Socket Layer
- C. Transmission Control Protocol
- D. Internet Protocol

**Question 5** This question has one correct answer

- How may data be transmitted to a web server in an HTTP GET request? [1]
- A. It may be sent within HTML form data
  - B. It may be sent within the body of the request
  - C. By appending the request URL with a query string containing field-value pairs
  - D. It can't. Data can only be retrieved with a GET request

**Question 6** This question has one correct answer

- In a relational database table, what name is given to the field or combination of fields that uniquely identifies each record? [1]
- A. PRIMARY KEY
  - B. FOREIGN KEY
  - C. SUPER KEY
  - D. CANDIDATE KEY

**Question 7** This question has one correct answer

- In the 3-tiered application model, a web application's architecture is segmented into 3 parts or tiers. In which of these 3 tiers would a web and/or application server reside? [1]
- A. Presentation tier
  - B. Middle tier
  - C. Data tier
  - D. Any of the above

**Question 8** This question has one correct answer

- In SQL, what is the purpose of the JOIN clause? [1]
- A. To merge two or more tables in the database
  - B. To insert data in two or more tables with a single query
  - C. To update data in two or more tables with a single query
  - D. To combine records from two or more tables in a single result set

**Question 9** This question has one correct answer

- A MySQL database administrator wants to allow a user called 'jhon001' the ability to 'read' data from all tables in a single database called 'db1'. They do not want the user to be able to modify the data in any way. Which of the following SQL statements would best achieve this? [1]
- A. GRANT ALL ON 'db1'.\* TO 'jhon001'@'somehost';
  - B. GRANT SELECT ON \*.\* TO 'jhon001'@'somehost';
  - C. GRANT SELECT ON 'db1'.\* TO 'jhon001'@'somehost';
  - D. GRANT ALL ON \*.\* TO 'jhon001'@'somehost';

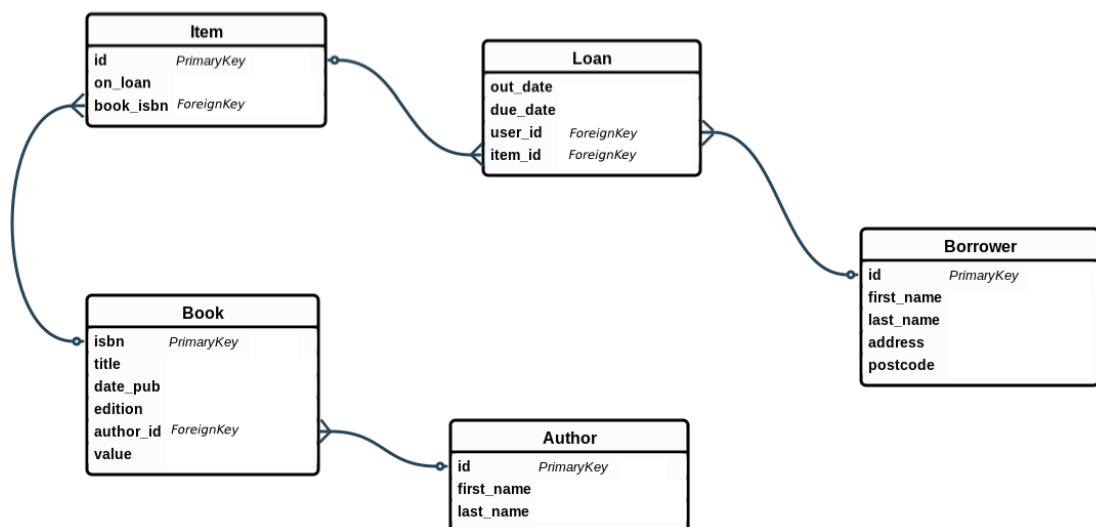
**Question 10** This question has one correct answer

Which of the following is NOT a justification for database normalisation? [1]

- A. 'It helps eliminate redundant data'
- B. 'It helps ensure data is logically stored'
- C. 'It can increase the efficiency by which data is accessed and manipulated'
- D. 'It makes the process of joining data from multiple tables simpler'

**Question 11** This question has one correct answer

According to the following entity relationship diagram for a book lending application, which of the following functional dependencies is TRUE? [1]



- A. Loan.item\_id => Item.id
- B. Item.id => Loan.item\_id
- C. Book.title => Item.book\_isbn
- D. None of the above

**Question 12** This question has one correct answer

If the schema given in question 11 were to be implemented in MySQL, how many columns would the Borrower table have? [1]

- A. 3
- B. 4
- C. 5
- D. It's impossible to tell

**Question 13** This question has one correct answer

In a MySQL database based on the the diagram from question 11, which of the following queries would return the titles of books by Jane Austen? [1]

- A. `SELECT first_name, last_name FROM Author INNER JOIN Book ON Book.author_id=Author.id WHERE last_name='Austen' AND first_name='Jane';`
- B. `SELECT Book.title FROM Book WHERE Author.last_name='Austen' AND Author.first_name='Jane';`
- C. `SELECT Book.title FROM Book INNER JOIN Author ON Book.author_id=Author.id WHERE Author.last_name='Austen' AND Author.first_name='Jane';`
- D. `SELECT title FROM Book WHERE author='Jane Austen';`

**Question 14** This question has one correct answer

According to the schema illustrated in question 11, which of the following statements should, logically, be FALSE? [1]

- A. A single instance of Author may be associated with many instances of Book
- B. A single instance of Book may be associated with many instances of Item
- C. A single instance of Loan may be associated with many instances of Borrower
- D. A single instance of Borrower may be associated with many instances of Loan

**Question 15** This question has one correct answer

In the diagram from question 11, it is not indicated which field(s) will form the PRIMARY KEY of the Loan table. Which of the following solutions is NOT likely to be acceptable? [1]

- A. Make user\_id the primary key
- B. Add an extra 'id' field and make it the primary key
- C. Make item\_id the primary key
- D. Make user\_id and item\_id a compound primary key

**Question 16** This question has one correct answer

According to the diagram from question 11, which of the following best describes the relationship between the Borrower and Loan tables? [1]

- A. One-to-Many
- B. Many-to-One
- C. One-to-One
- D. Many-to-Many

**Question 17** This question has one correct answer

Which of the following data types would be more suitable for storing the Author first\_name? [1]

- A. CHAR(25)
- B. VARCHAR(25)
- C. TINYTEXT
- D. TEXT

**Question 18** This question has one correct answer

In a database following the relational model, what is a junction or link table? [1]

- A. A table with common fields from two or more tables (resolves a many-to-many relationship)
- B. A table that is linked to a table in a different database by a foreign key
- C. A table which shares a common field with another table (resolves a one-to-many relationship)
- D. A table in which all the fields are foreign keys

**Question 19** This question has one correct answer

In SQL, what does the COMMIT command do? [1]

- A. Starts a local transaction on a database connection
- B. Undoes transactions that have not already been saved to the database
- C. Groups a set of related queries
- D. Saves changes invoked by a transaction to the database

**Question 20** This question has one correct answer

In a data driven web application, which type of HTTP request is generally used when creating a new resource containing sensitive information (i.e. when setting up a profile on a dating website)? [1]

- A. PUT
- B. GET
- C. POST
- D. DELETE

**Question 21** This question has one correct answer

Which of these is NOT a feature of cookies? [1]

- A. Ability to track users across sessions and visits
- B. Provide a consistent user experience
- C. Securely store passwords
- D. Keep a record of user preferences

**Question 22** This question has one correct answer

What is the purpose of \$\_SESSION\_[]? [1]

- A. To register a global variable
- B. To initialise sessions on each page using them
- C. To store variables of the current session
- D. None of the above

**Question 23** This question has one correct answer

Array values are keyed by \_\_\_\_\_ values (called indexed arrays) or using \_\_\_\_\_ values (called associative arrays). Of course, these key methods can be combined as well. [1]

- A. Float, string
- B. Even number, string
- C. String, Boolean
- D. Integer, string

**Question 24** This question has one correct answer

Which one of the following can be used to instantiate an object in PHP assuming class name to be 'foo'? [1]

- A. `$obj = new $foo;`
- B. `$obj = new foo;`
- C. `$obj = new foo ();`
- D. `obj = new foo ();`

**Question 25** This question has one correct answer

Which keyword is used to refer to properties or methods of the object itself? [1]

- A. `private`
- B. `protected`
- C. `public`
- D. `$this`

**Question 26** This question has one correct answer

Which of the following would be a potential match for the Perl-based regular expression `fo{2,4}`?

- i. fol
- ii. fool
- iii. foool
- iv. fofofof

- A. Only i
- B. ii & iii
- C. i, iii & iv
- D. i & iv

**Question 27** This question has one correct answer

When you're uploading files you need to set the enctype of the form to \_\_\_\_\_. [1]

- A. `text`
- B. `text/file`
- C. `multipart/form-data`
- D. `multimedia/form-data`



**Question 28** This question has one correct answer

Which commands will sanitise the input from a form?

[1]

- A. `trim(strip_tags($_POST['entry']));`
- B. `strip(trim_tags($_POST['entry']));`
- C. `trim(inject($_POST['entry']));`
- D. `slash(strip_tags($_POST['entry']));`

**Question 29** This question has one correct answer

Consider the following database query:

```
$sql = "INSERT INTO Students (name) VALUES ('{$_POST['student_name']}')";
```

Which of the following could a malicious user enter in a form to exploit the security loophole?

[1]

- A. `INSERT INTO students (name) DROP TABLE students; --'`
- B. `INSERT INTO students (name) VALUES ('Robert'); DROP TABLE students; --'`
- C. `INSERT INTO students (name) VALUES ('Robert') DROP TABLE students; --'`
- D. `INSERT INTO students (name) VALUES ('Robert') DELETE TABLE students; --'`

**Question 30** This question has one correct answer

Which statement will add 'Delta' to the end of the list?

```
$list = array ('Alpha', 'Beta', 'Gamma');
```

[1]

- A. `$list = $list + 'Delta';`
- B. `$list = $list.'Delta';`
- C. `$list[4] = 'Delta';`
- D. `$list[] = 'Delta';`

**Question 31** This question has one correct answer

Which of the following can be used when debugging to show the contents of an array or object?

- i. `print_r()`
- ii. `var_dump()`
- iii. `print_o()`
- iv. `print_var()`

[1]

- A. i
- B. i & ii
- C. ii & iii
- D. iii & iv

**Question 32** This question has one correct answer

- Which of the following statements is FALSE? [1]
- A. The contents of a GET request are visible in the browser
  - B. Reloading a POST page produces a prompt in the browser
  - C. A page generated from a form by GET can be bookmarked
  - D. A page generated from a form by POST can be bookmarked

**Question 33** This question has one correct answer

- Which HTTP header can be used by a PHP script to redirect to a new page? [1]
- A. `Location(header: '/newpage.php');`
  - B. `redirect.to('http://www.mysite.com/newpage.php');`
  - C. `header('Location: http://www.mysite.com/newpage.php');`
  - D. `http_header('Location: http://www.mysite.com/newpage.php');`

**Question 34** This question has one correct answer

- In the internet protocol stack, which protocol layer is primarily responsible for reliable (error-free) transmission? [1]
- A. TCP
  - B. IP
  - C. HTTP
  - D. SSH

**Question 35** This question has one correct answer

- SMTP is an email protocol. Which layer of the internet protocol stack is it part of? [1]
- A. Application
  - B. Transport
  - C. Internet
  - D. Link

**Question 36** This question has one correct answer

- For a simple search function on a website, which is the correct MYSQL clause to use? [1]
- A. `WHERE title LIKE '*test*'`
  - B. `WHERE title LIKE '$test$'`
  - C. `WHERE title LIKE '%test%'`
  - D. `WHERE $title LIKE '*test*'`

**Question 37** This question has one correct answer

Which of these is a valid constructor method?

[1]

- A. `__construct($w = 0, $h = 0)__`
- B. `__construct($w = 0, $h = 0)`
- C. `construct($w = 0, $h = 0)__`
- D. `construct(_$w = 0, $h = 0_)`

**Question 38** This question has one correct answer

What is the correct way to access the attribute 'name' of the object user?

[1]

- A. `$user->name`
- B. `$user->$name`
- C. `user->$name`
- D. `user->name`

**Question 39** This question has one correct answer

A TCP socket is identified by 4 numbers. Two are the source and destination IP address. The other two are the source and destination what?

[1]

- A. Port numbers
- B. TTL numbers
- C. Ping numbers
- D. Handshake numbers

**Question 40** This question has one correct answer

What address uniquely identifies devices at the LINK layer of the internet protocol stack?

[1]

- A. DNS address
- B. MAC address
- C. TCP address
- D. POP address

## Part B

### Question 41

The company you work for are planning to launch a new website called which-movie.com.

You have been tasked with designing and developing a web application that will allow an end user to perform the following tasks:

- Search a database of movies by title, release year, genre, director, actor/actress, and average user rating
  - Create an account/user profile page (as shown in the wireframe below)
  - Rate a movie on a 5 point scale
  - Post a written review of a movie
- (a) Sketch out an entity relationship diagram for the whichmovie database. Indicate on the diagram what data types will be used, and any constraints that will be applied. [8]
- (b) It has been decided that the whichmovie database will use the MySQL database management system. Referring to your answer from part ??, write the SQL query/queries that will need to be run when a user sets up their profile page via the HTML form shown in the wireframe below. Where values are required in the query string(s), insert appropriate 'dummy' values. [6]

The wireframe shows a web page layout for creating an account. At the top left is a 'LOGO' box. At the top right is a navigation bar 'NAV' containing 'Log in | Sign Up' links. The main content area is titled 'Create an Account'. It contains five input fields: 'Username', 'Password', 'Confirm password', 'Email', and 'Favourite genre'. Each of the first four fields has an asterisk (\*) indicating it is required. The 'Favourite genre' field is a dropdown menu with 'No preference' selected. Below the fields is a 'Create' button.

- (c) The company have indicated that they plan to launch a sister site, whichgame.com, at a later date. They are not yet sure what database management system the sister site will use, but are sure that it will share the same functionality, while having a different look and feel to whichmovie.com. As the developer, what steps could you take to minimise future development time? [6]

### Question 42

You have been asked to create a simple website for a local art gallery. The main requirement is to be able to upload images of the paintings to the site.

- (a) Describe the steps involved in enabling image upload to the site. Include necessary details for

- the upload form
- image validation
- storing the image in an uploads directory
- adding the image name to a database

[6]

- (b) Only the gallery administrators will be able to upload images. Explain how you would implement a login process. Describe how each admin page would check that the user has been validated.

Write an SQL query to check a username and password against details stored in a user database (you can use mysqli or PDO to execute the query).

[8]

- (c) The gallery has decided to allow user comments under the image of each painting. What would need to be added to enable this and how would the comments be connected to the images?

[6]

### Question 43

You are part of a team launching a new film review site. Based on user generated content, it will allow users to add, edit and delete film reviews.

- (a) You have decided to structure the site using the MVC (Model-View-Controller) pattern.

- i. Describe the structure of the the Model-View-Controller pattern.
- ii. Describe how you would organise your code to follow the Model-View-Controller pattern.
- iii. Give some details of how the different parts of your MVC structure would interact (you may include code snippets or pseudocode to illustrate your answer)

[8]

- (b) The team leader has asked you to use PHP data objects (PDO) to connect to the MySQL database. Why is this a good approach? Explain (using example code or pseudocode) how PDO prepared statements work.

[4]

- (c) Describe in detail, using code or pseudocode where necessary, a class that would allow you to make the necessary changes to the reviews database table.

[8]

#### Question 44

- (a) Explain the difference between a dynamic and a static web page and discuss their respective advantages and disadvantages. You may include diagrams where applicable. [6]
- (b) You have been presented with the following requirements for an e-commerce web application:
- A user may search for a product by entering keyword(s) into a search bar
  - They are then presented with a list of product names containing one or more of their search terms.
  - Clicking on a product name from the list will display the full details about that product

Describe how you would implement this application, indicating how and where dynamic content will be inserted. You may include code/pseudo-code where appropriate. [8]

- (c) Describe two different types of data stores that could be used by this application and discuss the suitability of each in relation to the following administrative tasks:
- Retrieving details about a specific order
  - Retrieving the email addresses of all customers who have ordered a certain item within the last month
  - Analysing customer demographic and sales data to identify purchasing patterns and predict future trends

Within your answer, you may also mention other factors which will influence the choice of database technologies used. [6]