

UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

Department of Computing
B. Sc. Examination 2019

IS52027C
Data, Networks and the Web

Duration: 3 hours

Date and time:

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 the main difference between a static website and a web application? [1]

- A. User interacts with web applications, no or minimum user interaction in static website
- B. A web application has usually static content
- C. HTTP requests are more secure in a web application than a static website
- D. There is no major difference between a website and a web application

Question 2 This question has one correct answer

Which of the following is another term for business logic, in 3-Tier web applications? [1]

- A. Front end
- B. Middleware
- C. Back end
- D. Presentation layer

Question 3 This question has one correct answer

Which of these languages run on the data tier, in 3-Tier web applications? [1]

- A. HTML
- B. Python
- C. HTTP
- D. SQL

Question 4 This question has one correct answer

Which sequence of words most accurately complete the following? [1]

When encryption and decryption algorithms are different, each person generates two keys, share one, ----, with everybody and keep one, -----, for him/herself. This type of encryption is called ----- encryption.

- A. Private key, public key, symmetric encryption
- B. Public key, private key, asymmetric encryption
- C. Public key, private key, symmetric encryption
- D. Private key, public key, asymmetric encryption

Question 5 This question has one correct answer

Which of these terms best describes a type of database that stores data in tables, where columns represent different attributes of each entity and rows represent a unique instance of an entity, dependency between tables can be modelled by a reference from one table to the other? [1]

- A. List of data
- B. Graph database
- C. Relational database
- D. NoSQL databases

Question 6 This question has one correct answer

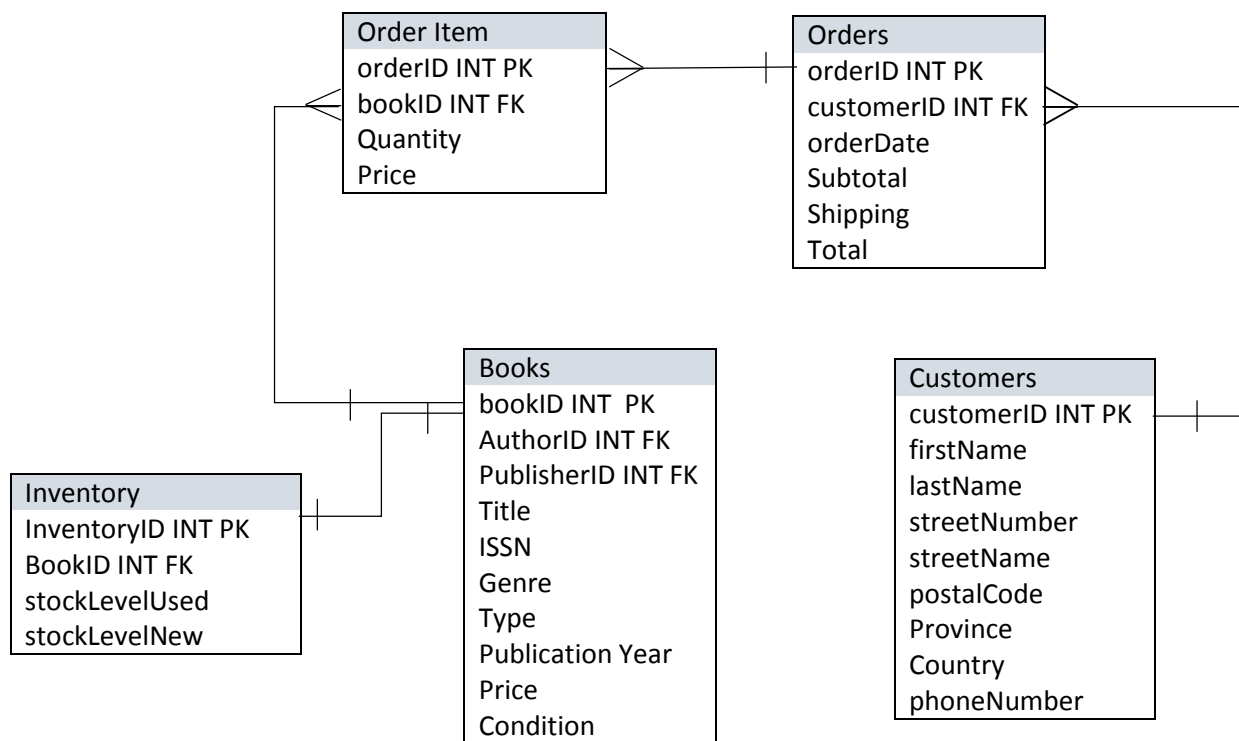
What are the main problems of list of data as opposed to relational databases?

[1]

- A. Redundancy and modification problems
- B. Redundancy and security of data
- C. Security and integrity of data
- D. Data Integrity and modification problems

Question 7 This question has one correct answer

The figure below shows the first 5 tables in an Entity Relationship (ER) diagram for an online book store. According to the diagram which of the following tables serves as a junction table? [1]



- A. Customers
- B. Books
- C. Orders
- D. Order Item

Question 8 This question has one correct answer

Referring to the ER diagram from Question 7, what kind of association has been modelled between the Customer and Order tables? [1]

- A. Zero-to-Many
- B. One-to-Many
- C. Many-to-Many
- D. These two tables are not related

Question 9 This question has one correct answer

Which terms best describe constraints in relational databases that are crucial to maintain accuracy, consistency and reliability of databases. These constraints includes two form of index constraints and referential constraints? [1]

- A. Integrity constraints
- B. Security constraints
- C. Primary key constraints
- D. Foreign key constraints

Question 10 This question has one correct answer

Which sequence of words most accurately complete the following? [1]

The difference between Inner join, left join and right join in SQL advanced querying is that: An inner join includes only ----- with matches in both tables, but left or right joins include all the ----- from one table and any matching from the other.

- A. Columns, columns
- B. Columns, rows
- C. Rows, rows
- D. Rows, columns

Question 11 This question has one correct answer

What name is given to the type of database queries that derive new information from existing data, queries run on many records, ACID properties often are not important and are mainly read queries?[1]

- A. On-line Transaction Processing (OLTP)
- B. Online Analytical Processing (OLAP)
- C. CRUD queries
- D. Scalable queries

Question 12 This question has one correct answer

Referring to question 11, what sort of databases are most suitable for queries explained in the above questions? [1]

- A. Column-based databases
- B. Row-based databases
- C. Relational databases
- D. Multi-model databases

Question 13 This question has one correct answer

Which sentence in **NOT** true about Flask framework? [1]

- A. It is a microframework
- B. It is a code library that makes developer's life easier
- C. It aims to keep the core simple but extensible
- D. It includes a database abstraction layer

Question 14 This question has one correct answer

NoSQL databases achieve higher performance for data of a massive scale, because they are: [1]

- A. very organised and structured
- B. less scalable
- C. designed for distributed storage and processing and vertical scaling is easier in NoSQL databases
- D. designed for distributed scaling and processing and horizontal scaling is easier in NoSQL databases

Question 15 This question has one correct answer

MongoDB is a: [1]

- A. relational database
- B. graph database
- C. document database
- D. multi-model database

Question 16 This question has one correct answer

Which of these statements better describes a web server? [1]

- A. A web server uses HTTP protocol to handle client requests
- B. A web server uses python scripting language
- C. A web server connects to mongoDB database
- D. A web server operates in Unix operating system

Question 17 This question has one correct answer

Which of the following offers a standard protocol for web servers to execute programs that run like console applications? [1]

- A. Database API
- B. Common Gateway Interface (CGI)
- C. Mongo
- D. Python scripting language

Question 18 This question has one correct answer

Which of the following application's backend is the most suitable one to be modelled by a NoSQL graph database? [1]

- A. Online banking
- B. Social network
- C. Static web applications
- D. mongoDB applications

Question 19 This question has one correct answer

In the context of Database APIs (Application Programming Interfaces), which of the following is **NOT** a related term? [1]

- A. PyMongo
- B. MySQL connector
- C. HTTP request response cycle
- D. Database driver

Question 20 This question has one correct answer

Which of the following are among the benefits of Separation of Concerns (SoC) concept in software design? [1]

- A. Integrity and testability
- B. Portability and performance
- C. Performance and maintainability
- D. Portability and maintainability

Question 21 This question has one correct answer

Which of these statements better describe the difference between GET and POST HTTP methods?[1]

- A. GET is a HTTP request method and POST is HTTP response method
- B. GET transfers data in the URL and POST in body of the request
- C. POST requests data and GET handles the response
- D. POST requests data and GET submits data to be processed in an HTML form

Question 22 This question has one correct answer

In security of data in transit, which three are needed to be provided? [1]

- A. Client and server authentication, data integrity, data-in-motion encryption
- B. Client and server authentication , Hashing, encryption
- C. data integrity, Hashing, encryption
- D. eradication, hashing, data-in-motion encryption

Question 23 This question has one correct answer

Robust exception handling, modularization of code and testing are various ways to improve which of the following? [1]

- A. Code reliability
- B. Code security
- C. Performance
- D. Database

Question 24 This question has one correct answer

Which characteristics of packet switching results in better bandwidth utilisation and response time compared to circuit switching technology used for telephony systems? [1]

- A. Rapid store and forward networking design
- B. Dividing messages up into arbitrary packets
- C. Routing decisions made per-packet
- D. All of the above

Question 25 This question has one correct answer

At which layer of TCP/IP model is the MAC address used?

[1]

- A. Application layer
- B. Transmit Layer
- C. Internet Layer
- D. Link Layer

Question 26 This question has one correct answer

Which of the following are attributes of TCP (Transmission Control Protocol) compared to UDP (User Datagram Protocol)?

[1]

- A. TCP is more suitable for live broadcasting and online gaming
- B. TCP throws all the error-checking stuff out
- C. TCP is slower than UDP
- D. TCP is not connection-oriented

Question 27 This question has one correct answer

Which protocols corresponds to application, transmit and internet layers in Internet protocol stack in that order?

[1]

- A. HTTP, TCP, IP
- B. TCP, IP, HTTP
- C. HTTP, IP, TCP
- D. IP, HTTP, TCP

Question 28 This question has one correct answer

You can assign routes to functions in flask using:

[1]

- A. `If __name__ == '__main__':`
- B. `@app.route()`
- C. `Return <h1>route</h1>`
- D. `myroute = flask(__name__)`

Question 29 This question has one correct answer

What is the difference between `request.args.get('publication')` and `request.args['publication']` in flask? [1]

- A. No difference
- B. You need to catch error key after `request.args.get('publication')`
- C. You need to catch error key after `request.args['publication']`
- D. `request.args.get('publication')` is related to POST request and `request.args['publication']` to GET request

Question 30 This question has one correct answer

Which statement is **NOT** related to inheritance in Jinja templates? [1]

- A. `{% extends "base.html" %}`
- B. `@app.route('/inherit')`
- C. Base template
- D. Child template

Question 31 This question has one correct answer

Which of the following does complete this sentence: A decorator in flask: [1]

- A. decorates forms in flask
- B. is used in WTform
- C. is used in flask_wtf
- D. wraps a function, modifying its behaviour

Question 32 This question has one correct answer

What is the best way to tackle CSRF (Cross Site Request Forgery)? [1]

- A. Passing a key with the form in every session to the server
- B. Preventing hackers to enter a website
- C. Developing dynamic web application
- D. Using ACID properties

Question 33 This question has one correct answer

In the context of web applications, templating is good for which of the following? [1]

- A. DRY (Don't Repeat Yourself)
- B. Routing
- C. Inheritance
- D. Dynamic URLs

Question 34 This question has one correct answer

Which object in flask can be imported to access the data a client sends to the server? [1]

- A. datetime
- B. response
- C. request
- D. StringField

Question 35 This question has one correct answer

What is the most popular HTML, CSS, and JavaScript framework for developing responsive, mobile-first websites? [1]

- A. Bootstrap
- B. mongoDB
- C. MySQL
- D. PyMongo

Question 36 This question has one correct answer

What is **NOT** a database handle? [1]

- A. An abstract reference to a resource
- B. You must obtain it before working with a database
- C. Same as a database cursor
- D. Refers to a database

Question 37 This question has one correct answer

What is a cookie and where is it stored? [1]

- A. Key-value pair, server side
- B. Key-value pairs, user's machine
- C. Relational database, server side
- D. Relational database, user's machine

Question 38 This question has one correct answer

Which of the following is an ORM (Object Relational Mapper)? [1]

- A. cookie
- B. session
- C. bcrypt
- D. SQLAlchemy

Question 39 This question has one correct answer

What does “Rest” stand for in the context of web services?

[1]

- A. Representational Safe Transfer
- B. Representational State Transfer
- C. Rapid and Safe Transfer
- D. Rapid State Transfer

Question 40 This question has one correct answer

The main purpose for using Blueprints in flask is to develop a:

[1]

- A. Modular application
- B. Faster application
- C. More secure application
- D. Database API

Part B

Question 41

You are a freelance backend developer responsible for implementing a database for the online book store database, for which you were given an ER diagram in Question 7. The app is to be implemented using the MySQL Database Management System (DBMS).

- i. Referring to the ER diagram from Question 7, what does “FK” stand for and what is the purpose of it in ER diagram? [2]
- ii. The database model suggested by the ER diagram in question 7 is incomplete. It should be possible to add author and publisher data. Describe diagrammatically how you would modify and/or extend the existing schema to include author and publisher data. [4]
- iii. Write the queries you would use to insert this data in a relational 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	Year published
879	Great Expectation	123	98	1861
658	Oliver Twist	123	45	1837

- iv. Write one or more queries to retrieve all books published in 1861 that are currently in stock. [4]

Question 42

You have started a new job working as the lead developer to develop a mobile health app offering advice on prevention and/or management of Diabetes. The software is currently written in python and uses the MySQL Database Management System (DBMS).

- i. Another developer in your team suggests that MongoDB would offer a more `scalable' back-end solution than MySQL. What type of database is MongoDB, and why do you think they consider it a more `scalable' solution than MySQL? [4]
- ii. You have agreed to port the current MySQL back-end over to MongoDB. The table below provides a snapshot of the User table with some example data. How might this data be represented in MongoDB? [6]

id	username	password	email	Date_registered	Is_Diabetic
256	Ela001	34X567	e.v@jmail.com	19/02/2019	0
257	Syl002	Q98mk2	s.p@nomail.com	08/08/2018	1

- iii. Do you have any security concerns regarding password storage, how would you address that? [4]
- iv. The application middleware has been written in python. Fortunately, the application has been written in such a way that it requires minimum rewriting in order for it to work with a MongoDB back-end. Explain how the application has been written to minimise the need for rewriting code when porting between two different back-ends. For full marks you should explain how and why any techniques or principles you've identified are beneficial. [6]

Question 43

You are a full stack developer building an online book store app using Flask.

i. You have written a script with a single view that shows all the books stored in your database as follows:

```
from flask import Flask, request
from flask import render_template
from flask import redirect, url_for
import pymongo

class DBHelper:

    def __init__(self):
        client = pymongo.MongoClient()
        self.db = client['mybooks']

    def get_all_books(self):
        return self.db.books.find().sort('created_at',pymongo.ASCENDING)

app = Flask(__name__)
db = DBHelper()

@app.route('/')
def index():
    allbooks = db.get_all_books()
    return render_template("index.html", allbooks=allbooks)

if __name__ == '__main__':
    app.run(debug=True,host='0.0.0.0',port=8000)
```

Explain what the following lines do:

[10]

```
from flask import Flask

app = Flask(__name__)

db = DBHelper()

@app.route('/')

def index():
    allbooks = db.get_all_books()
    return render_template("index.html", allbooks=allbooks)

if __name__ == '__main__':
    app.run(debug=True,host='0.0.0.0',port=8000)
```

ii. Now you want to add a new view called 'addbook' which adds a new used book submitted via a form including book title, author and publisher, using a new call to the database which inserts the data. Complete the code shown below replacing AAA, BBB, CCC and DDD with proper pieces of code.

```
@app.route(AAA)
def BBB
    if CCC:
        db.add_book(request.DDD)
        return redirect(url_for('index'))
    return render_template('add_book.html')
```

[7]

iii. Write a new function (add_book) in DBHelper class to complete your code.

[3]

Question 44

You have created a web application for a car rental company, now you want to design a review page for customers to post a review on the car rental service they have received. Your review page get user review and displays other reviews using a Jinja template. You have written a python script with a function and a view and a render_template referring to the following template:

```
{% extends "base.html" %}
{% block body %}

<div class="jumbotron">

<div class="form-horizontal">
    <form method="post" action="/add_review">
        <p>review<input type='text' name='review'>
        <p><input type='submit' value='post review'>
    </form>
</div>

</div>

{% endblock %}
```

i. Explain what the following lines of code do? [6]

```
{% extends "base.html" %}
{% block body %}

<form method="post" action="/add_review">

<p>review<input type='text' name='review'>
```

ii. The use of templates by Flask is an example of a principles of programming known as 'Separation of Concerns'. What does this mean and why is it useful? [4]

iii. You decide to use the Flask-WTF extension to implement WTForms in your app. The application uses a form to enter new car hire reservation including fields; firstname, lastname, email, driving license number. Describe, and illustrate with code, the role of the Flask-WTF extension in form submission and processing and any advantages it offers. (You do not need to include details of any database interactions). [10]