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**1. Python theory questions**

1. What is the program?

In computer science program is a list of instructions written in special language so that a computer can interpret and execute it

2. What is the process?

In CS a process is a self-contained task in the OS, which can run concurrently with other processes.

3. What is Cache?

In CS Cache is a small amount of memory where some values required for the program are stored. Cache has faster access speed compared to RAM, due to its location to the CPU. Therefore, the access to the values stored in cache is faster

4. What is Thread and Multithreading?

A thread is a basic unit to which OS allocates processor time**.** Thread execution is an execution of a sequence of instructions that can be "interrupted" to start executing other threads. This allows one CPU to be concurrent and creates and illusion of multitasking, whereas it's actually very switches between different thread executions. And multithreading is when one process spawns multiple threads for running, for example, a complex application

5. What is GIL in Python and how does it work?

Python's Global Interpreter Lock makes sure that there are no and deadlocks (e.g. garbage collection) by putting a lock on the interpreter, so that only one thread can be run at one single point of time

6. What is Concurrency and Parallelism and what are the differences?

Concurrency is a way to switch between tasks to create an illusion of them being executed at the same time. One CPU can execute only one instruction at an instance. On the other hand, parallelism actually runs multiple tasks/instructions at an instance, and usually achieved by multi-core processors

7. What do these stand for in programming: DRY, KISS, BDUF

These are the principles of ‘good’ programming

DRY – don’t repeat yourself. It means that there is no need to repeat pieces of code, where possible

KISS – keep it simple stupid. It means that the program should be written in the simplest way possible

BDUF – big design upfront. I means that development and improvement of  design should be done before implementation stage of the project

8. What is Garbage collector? How does it work?

Garbage collector is a special process by which Python removes unnecessary objects to free the memory space automatically. Garbage collector reclaims blocks of memory that are not used, which makes python more memory efficient language.

9. What are ‘deadlock’ and ‘livelock’ in a relational database?

Deadock and livelock are two situations which lock manipulation on data within relational databases. Although both locks have similarities, their origins are different. A deadlock is a situation when two transactions hold locks on the data required for the other transaction, in these case both transactions cannot proceed further, until one of them is terminated, and second one can proceed. A livelock, on contrary, is a situation when multiple different threads can't get lock because they keep interfering with each other when one of them tries to lock it

10. What is Flask and what can we use it for?

Flask is a lightweight web framework used to build APIs/web applications using Python. Flask can be used to develop web applications of different complexity (for example, binding to databases and frontend)

**2. Discuss the difference between Python 2 and Python 3**

Although Python 2 and 3 have many similarities, there are number of major differences in syntax, libraries, functions and variable creation.

Firstly, Python 3 has much more libraries than Python 2. Moreover, these libraries are constantly maintained and improved

Secondly, there are few changes in syntaxis, for example print function in Python 2 did not have round brackets, but in Python 3 it has.

Thirdly, in Python 2 strings are stored in ASCII format by default, but Python 3 uses UNICODE, which contains much more characters suitable for different languages and even emojis.

Moreover, division function in python2 yields in int rounding down, whereas python3 returns float value;

These are not all differences between Python 2 and Python 3, but I have discussed the main ones to my opinion.

**3. Write a function that can define whether a word is a Palindrome or not**

Please refer to the attached file palindrome.py

**4**. **Write tests for the newly created Palindrome function. Provide a brief explanation for your test case options.**

Please refer to test\_palindrome.py file

Test case 1: Valid palindrome. All same-case letters (for example aziza)

Test case 2: Valid palindrome. All different-case letters (for example AZiza)

Test case 3: Valid palindrome. Even number of letters (for example Avva)

Test case 4: Valid palindrome. Odd number of letters (ex: Aziza)

Test case 5. Test single letter palindrome (since one letter words are also palindromes ‘a’)

Test case 6. Invalid palindrome (ex: ‘hello’)

Test case 7. Test non-string input (example: 1221)

**5. Agile methodology, Scrum: name at least 3 types of meetings that are exercised by Agile teams and describe the objective of each meeting.**

Agile methodology is project management method which is bases on the idea of breaking project into several phases and iterative development. The process behaves like a close loop feedback, involving constant communication/collaboration with stakeholders. Every single stage is then adjusted basing on the received feedback. The development teams work within cycles of planning, executing, and evaluating throughout the project. One of the greatest advantages of Agile method is that the value is delivered fast, flexible, and open for the changes.

Scrum one of the most widely used Agile methodologies. The distinctive feature of Scrum method is that several types of meetings are exercised by working teams, during the development process. For example, short stand-up meetings, retrospective meetings, and feedback meetings with client.

Stand-up meetings are short regular meetings that aimed to update and share information on daily basis with team members within one sprint.

Retrospective meetings are held at the end of each sprint to review and discuss the results of the sprint, and sprint itself

Feedback meetings with customers are held regularly after each sprint to get feedback on the produced piece of value, to use it in next sprint

**6. Exception handling in Python, explain what each of the following blocks means in the program flow: Try, except, else, finally**

**Try:** Try block is the first block to be executed, which potentially can raise an error. The code is executed line by line until error occurs.

1. If error is captured, the Except block is executed
2. If no errors, Else block is executed

**Except:** Except block contains a code that is executed in case of error in Try block. Usually contains message informing user about the error

**Else:** Else block is executed, in case if no error occurred in Try block

**Finally:** This block is executed last, no matter if there was error in try block or not

**7. How can we connect a Python program (process) with a database? Explain how it works and how do we fetch / insert data into DB tables from a python program**.

Python program can be connected to the database by several methods. There are many packages and libraries which provide this functionality, such as MySQL or SQLAlchemy. The mysqldb package enables user to run the queries from Python code.

To do so, firstly the connection to database should be opened by using mysqlconnector library, by providing personal credentials such as username, password and host.

After that the cursor is opened, which enables us to run different queries to the existing database or create new db-s and tables. Mysqldb enables user to write queries in same syntax as in mySQL. Some queries should be committed in order to be saved

Lastly all the cursor and connection should be closed.

For example:

db\_connection = \_connect\_to\_db(db\_name)

        cursor = db\_connection.cursor()

        query = """SELECT \* FROM Assessment\_2"""

        cursor.execute(query)

        results = cursor.fetchall()

        cursor.close()

db\_connection.close()

**8. Given two SQL tables below: authors and books.**

**● The authors dataset has 1M+ rows**

**● The books dataset also has 1M+ rows**

**Create an SQL query that shows the TOP 3 authors who sold the most books in total!**

SELECT a.author\_name, SUM(b.sold\_copies) as sold

FROM AUTHORS a

LEFT JOIN BOOKS b

ON a.Book\_name=b.book\_name

GROUP BY a.author\_name

ORDER BY sold

LIMIT 3;

**9. TWO NUMBER SUM:**

Please refer to two\_sum.py file