ASSESSMENT 1 – 25 March 2024

SUBJECT & LEVEL	:	**TECHNICAL PROGRAMMING 2**
SUBJECT CODE	:	**TPRO200/TLPR200**
DEPARTMENT	:	**INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**
QUALIFICATION	:	**DIPLOMA: INFORMATION TECHNOLOGY (IT)**
EXAMINER (S)	:	**MR X PIYOSE**
MODERATOR (S)	:	**DR MB MUTANGA**
FULL MARKS	:	**105**
TOTAL MARKS	:	**100**
NUMBER OF PAGES (incl. cover page)	:	**9**

DURATION OF ASSESSMENT	:	**180 MINUTES (3 hours)**
VENUE OF ASSESSMENT	:	**D9/D10**
TIME OF ASSESSMENT	:	**9h00 TO 11h30**
REQUIREMENTS	:	**- REFER TO THE NEXT PAGE FOR MANDOTORY REQUIREMENTS**

REQUIREMENTS AND IMPORTANT INFORMATION:

- ALL students are required to bring their own laptops as per the norm in the subject.
- Python version 3xxxxx should be installed. Note that python version 2xxx and version 1xxx are not permitted.
- All the following packages should have been installed already as per Activities 1, 2, 3 and 4 that students were required to do. The packages are: **numpy, pandas, scipy**, **scikit-learn**, **matplotlib** and **seaborn**.
- Visual Studio code must be installed and python extension should have been configured already.
- As per the norm in the subject, GIT should have been installed on student laptop for effective source code management.
- Each student should have a GitHub account.
- Very important: students that are working on Git bash or command line interface from a windows laptop should NEVER use the **cls** command during the test; and students that are working on a terminal from a Mac laptop should NEVER use the **clear** command.
- You will be instructed to commit at regular intervals and take a snapshot of your CLI or terminal screens during the test. Students should adhere to the instructions. Your lecturer will not entertain students that do not commit their work as instructed.
- The syntax to create a file is **"touch filename.extension"**, e.g. if you are asked to create an python file called school, you will use: **"touch school.py``'**.
- Students that have password related issues on blackboard should fix these issues with blackboard administrators as lecturers do not have administrative rights for permissions.
- Your lecturers GitHub username is **xpiyose,** or if you prefer to use the email address, it is: **xpiyose@gmail.com.**
- You will required to answer ALL questions.
- Negative marking may be used for syntax errors.
- Ensure your code is clean, well-commented, and adheres to software development best practices.
- Test your functions with sample data to demonstrate functionality.

Scenario:

In the context of enhancing democratic engagement among young voters within the Republic of South Africa, the government has resolved to inaugurate an online voting mechanism for the forthcoming electoral proceedings. This innovative system is designed to facilitate the casting of votes through a digital ballot, which enumerates the array of political parties registered (See Annexure A for ballot paper sample). It is pivotal to acknowledge that this listing serves purely as an illustrative framework; hence, the developed solution must exhibit adaptability to incorporate additional political factions that may not be initially listed in Annexure A. The inclusion of any political party within the system is contingent upon its formal registration and sanction by the Independent Electoral Commission (IEC), a prerequisite that necessitates the party's demonstration of a minimum membership of 1,000 individuals within its proprietary database. Furthermore, the programming solution must ensure the randomized storage of registered party members' data, enhancing the integrity of the electoral process.

Eligibility for electoral participation is predicated on the voter's registration within the IEC's comprehensive system, as delineated in Annexure B. This process is integral to the establishment of a verifiable voter identity during the electoral period. Consequently, the maintenance of detailed voter information is imperative, facilitating the identification process. Upon successful registration, voters are categorized according to their respective Voter’s Districts (VD), a classification that plays a crucial role in the electoral framework.

In light of the foregoing, you have emerged as a candidate for the role of Junior Python Developer. As part of the selection process, you are tasked with the development of a program that addresses the outlined requirements. This task is not only a testament to your technical proficiency but also your ability to engage with complex, real-world problems through computational solutions. It is essential that your programmatic response is informed by the scenario provided, alongside the specifications detailed in Annexures A and B. Your ability to interpret and implement these requirements will be a significant determinant of your suitability for the position, ahead of a subsequent in-person interview.

Question 1: Git and GitHub for Version Control (22 Marks)

Make sure that you commit at regular intervals and especially when it is necessary when answering this question.

1.1 Create a directory called "**tp2_test_1"** and make this your working directory to store **ALL** files that are required for this test. **Note:** *at the end of this test you will be required to push your project to the cloud and share the link with your lecturer. It is therefore crucial to store all test files under this directory*. *Your lecturer will not entertain any discussion about missing files if the instructions are not followed.* (3)

1.2 Create a file and name it **"readMe.md"**. In this file you must explain source code management life cycle for collaborative software development and provide an example for each stage of the life cycle. **Note:** *You MUST use appropriate git commands to create this file; a zero will be awarded for this question, if this instruction is not followed*. (8)

1.3 In your local machine, initialize a git repository. **Hint:** *pay attention to the term* ***local machine***. (2)

1.4 Create a branch named **"feature-voter-registration"**, make changes by adding a python file that displays a message **"Register to vote, your vote is your power to make a change"** named **"registration.py"**, and merge it back to the main branch. (7)

1.5 Now create a cloud repository and add myself (your subject lecturer) as your collaborator. My username is "**xpiyose"** or if your cloud account is giving you problems you may use xpiyose@gmail.com written in full where it requires a username. Your repository configuration should be public and such that I can be able to make changes. **Hint:** *pay attention to the term cloud.* (2)

VERY IMPORTANT NOTIFICATION: take a screenshot of your Command Line Interface, or Git bash, or terminal and save it as an image with a name **"qstOne"** into your **"tp2_test1"** folder.

Question 2: Data structures and algorithms (61 Marks)

Make sure that you commit at regular intervals and especially when it is necessary when answering this question.

This question is based on the scenario; Annexure A and Annexure B. It is important to read the scenario in relation to the context of each question. For uniformity and marking purpose, you MUST use the variables that are indicated in this question as is. However, you will notice that there are some questions where not all variables are provided at which you suppose to come up with your OWN variable naming to test your analysis of the problem given. Remember to work on the same directory that you created on question 1.1 above!

2.1 Write a python function named **"register_party"** that takes a list of parties. Each party must be presented by key value pairs. The keys should be **"party_name"**, "**reg_number**", **"member_count"**). The function should check if the new party has acceptable number of members for it to be registered as per the requirements narrated in the scenario. Note: this function must be written under the git branch that you created in question 1.4 above. (15)

2.2 Now a new party called MK party which has 5300 members wants to apply to register the party for the next election. Write python statements that will show how will the function that you created in question 2.1 be executed such that it registers the MK party if it meets the criteria as per IEC regulations. Assume that the last party that was registered had a registration number 10003318, and every new party that is being registered will be generated a registration number that increments the last registered party by 1. (6)

2.3 Implement a function called **"update_voter_info"** where each key is a **voter_id** and the value is another dictionary containing **name**, **voting_district** and **has_voted**. The function should update the voter's information or add a vote if not already voted. **Very important hint:** *you should think of best practices for source code management and collaboration using git, for instances; is it a good practice to answer this question under the directories that are already existing or you should create a feature branch for development. From this question onwards you won't be guided like you have been on questions prior to this. Always think best practices for software development as discussed in class. Create a new file, new directory, new feature branch where necessary.* (13)

2.4 Using list comprehension and the filter function, write a piece of code that filters out all parties from a given list that have less than 1,000 members. Use ALL the parties that are on the ballot paper in Annexure A as your list elements, only capture their abbreviation as elements e.g. capture EFF on your list of elements instead of “Economic Freedom Fighters” as it is displayed using EFF abbreviation on the ballot paper. (10)

2.5 Rewrite the list comprehension in question 2.4 into a normal list data structure. (8)

2.6 Write a python expression using a lambda function and the filter function to extract only those records where the voter is marked as registered **('registered': True)**. Assign the result to a variable named **“registered_voters”**. (6)

2.7 Update the “readMe.md” file that you created on question 1.2, by indicated the main reason sets data structure is not a good data structure for this scenario. You should add this to the end of the file. (3)

Friendly reminder: from question 2.3 to question 2.7 – you must adhere to the very important hint written in question 2.3!

VERY IMPORTANT NOTIFICATION: take a screenshot of your Command Line Interface, or Git bash, or terminal and save it as an image with a name “qstTwo” into your “tp2_test1” folder.

Question 3: Basic on Data insights (programming perspective) (24 Marks)

For this question, you must download football dataset labelled football.csv from blackboard before attempting any of the questions.

Remember: the very important hint that was explained in question 2.3!!

3.1 Write a program that will load the **"football.csv"** dataset into a dataframe called **"foot_ball"**. (5)

3.2 inspect the dataframe by listing and displaying the last 7 rows of the dataframe using a single python statement. (2)

3.3 Write python statements to:

3.3.1 Access and display the **"Nationality"** and **"Club"** columns for the first all players. (2)

3.3.2 Access and display the data for the tenth player in the dataset using row index. (2)

3.3.3 Access and display the "**Goals"** and **"Appearances**" for players with index positions 100 to 110. (2)

3.3.4 Add a new column named "**Goals per Appearance"** that is calculated by dividing **"Goals"** by **"Appearances"**; and display the first 5 rows of the updated dataset. (3)

3.3.5 Select and display a subset of the dataframe containing only the players from **"Arsenal"** club. (2)

3.3.6 Perform a filtering operation to display players who have scored more than 5. (3)

3.4 Write a command to upgrade the pandas module so that it downloads new dependencies if needed. (2)

3.5 Push your entire git "tp2_test1" project into the cloud repository that you created on question 1.5 and confirm that I am added as a collaborator to your project. (1)

VERY IMPORTANT NOTIFICATION: take a screenshot of your Command Line Interface, or Git bash, or terminal and save it as an image with a name "qstThree" into your "tp2_test1" folder.

_____end of the test_____

Annexure A: Ballot paper sample 2021, published by Specimen

Specimen **NATIONAL** Specimen

AFRICAN SECURITY CONGRESS	ASC	
AFRICAN TRANSFORMATION MOVEMENT	ATM	
AFRIKAN ALLIANCE OF SOCIAL DEMOCRATS	AASD	
AFRICAN NATIONAL CONGRESS	ANC	
AGANG SOUTH AFRICA	AGANG SA	
AL JAMA-AH	ALJAMA	
ALLIANCE FOR TRANSFORMATION FOR ALL	ATA	
AZANIAN PEOPLE'S ORGANISATION	AZAPO	
AFRICAN PEOPLE'S CONVENTION	APC	
BETTER RESIDENTS ASSOCIATION	BRA	
BLACK FIRST LAND FIRST	BLF	
CAPITALIST PARTY OF SOUTH AFRICA	ZACP	
CHRISTIAN POLITICAL MOVEMENT	CPM	
COMPATRIOTS OF SOUTH AFRICA	CSA	
CONGRESS OF THE PEOPLE	COPE	
DEMOCRATIC ALLIANCE	DA	
DEMOCRATIC LIBERAL CONGRESS	DLC	
ECONOMIC EMANCIPATION FORUM	ECOFORUM	
ECONOMIC FREEDOM FIGHTERS	EFF	
FORUM 4 SERVICE DELIVERY	F4SD	
FREE DEMOCRATS	FREE DEMS	

Annexure B: voter's registration form (part 1) published by IEC 2024