**WRITTEN EXAM**

*Ability to communicate effectively in writing will be evaluated overall throughout the examination*

**QUESTION #1**

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| ***The following question will assess:***   * *Knowledge of the software development lifecycle (SDLC) and methodologies* |

Define the Software Development Lifecycle (SDLC) process, name the phases and describe each. Name a software development or project management methodology and describe how it follows the SDLC.

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| The Software Development Lifecycle (SDLC) is a systematic process used by organizations to design, develop, test, and deploy software applications or systems. It encompasses several phases, each serving a specific purpose in the software development process. Here are the common phases of the SDLC:  Requirement Gathering and Analysis: This phase involves gathering and understanding the requirements for the software from stakeholders. It includes gathering user needs, analyzing market requirements, and defining the scope of the project. Design: In this phase, the system architecture and design are created based on the gathered requirements. It involves creating detailed technical specifications, data models, and architectural diagrams. Implementation or Development: This phase involves actual coding or development of the software based on the design specifications. Developers write code, following coding standards and best practices. Testing: Once the software is developed, it undergoes various types of testing to ensure it meets the specified requirements and is free of defects. Testing includes unit testing, integration testing, system testing, and acceptance testing. Deployment: After successful testing, the software is deployed to the production environment. Deployment involves installing the software, configuring it, and making it available for end-users. Maintenance: Once the software is deployed, it enters the maintenance phase where it is monitored, updated, and maintained to ensure it continues to meet the changing needs of users and remains compatible with the evolving environment.  Agile Methodology:  Agile is an iterative and incremental approach to software development that emphasizes flexibility, customer collaboration, and responsiveness to change. Instead of following a sequential process like the Waterfall Model, Agile breaks the project into smaller iterations called "sprints." The SDLC phases are still present in Agile but are executed iteratively: Requirement Gathering and Analysis: Agile begins with an initial gathering of requirements, but instead of detailing all requirements upfront, Agile focuses on gathering just enough information to start development. Requirements are continually refined throughout the project. Design: Design in Agile is more dynamic and evolves iteratively as the project progresses. Initial design decisions are made, but they can be revisited and adjusted in each iteration based on feedback and changing requirements. Implementation or Development: Agile development occurs in short iterations, typically lasting one to four weeks. During each iteration, a small set of features is developed, tested, and delivered. This iterative approach allows for early and continuous delivery of valuable software increments. Testing: Testing is an integral part of Agile development and occurs continuously throughout the project. Automated testing is often emphasized to ensure rapid feedback and maintain quality. Deployment: Agile encourages frequent deployments of working software, often at the end of each iteration. This allows stakeholders to provide feedback early and helps in validating assumptions and making necessary adjustments. Maintenance: Agile projects embrace change, and maintenance activities are ongoing throughout the project. As new requirements emerge or existing ones evolve, they are prioritized and incorporated into future iterations. |

**QUESTION #2**

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| ***The following question will assess:***   * *Ability to design, develop, test, and analyze code (for example Python, JavaScript).* * *Ability to use version control systems, for example: Git* |

The git repository at <https://github.com/CWFIS/exam-question> contains the file map.html which shows a Leaflet map displaying active fires in Canada. Clone the repo, create a new branch, then make the following changes to the file:

* Only display fires originating in Alberta.
* Display the fire name, stage of control, and start date formatted like “Mar 3, 2024” when clicking on a fire.
* If the calculated hectares for a point are less than 1 or null, make the inside of the point transparent. If the calculated hectares are greater than 1000, make the inside of the circle opaque.

Make a single commit for each change.

Include a git patch file named map.patch (to be applied via git apply) documenting your changes with your submission.

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| Changes made:  Added a filter to only display fires originating in Alberta (filter function). Adjusted the style function to set the fillOpacity based on hectares, making the inside of the point transparent if hectares are less than 1 or null, and opaque if greater than 1000. Modified the onEachFeature function to display the fire name, stage of control, and start date formatted as "Mar 3, 2024" when clicking on a fire.  File name: map\_patch.html |

**QUESTION #3**

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| ***The following question will assess:***   * *Ability to develop, implement and maintain computer models,* * *Creativity* |

Using a programming language of your choice write a program that obtains world population data by country from the public API located at <https://restcountries.com/v3.1>. From these data, calculate and display the following:

* For each country, the country name and its population density (population per unit area).
* The mean, median and standard deviation of the population density.
* The number of countries who are UN members, and the number of countries who use the Euro as a currency.

The API endpoint documentation can be found at <https://restcountries.com/>.

Include the programming language used, your code for the solution, and any additional setup instructions with your submission.

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| I have created Python script that utilizes the requests library to fetch data from the provided API and performs the required calculations:  This Python script fetches data from the provided API, calculates the population density for each country, and then computes the mean, median, and standard deviation of the population densities. It also counts the number of countries that are UN members and the number of countries that use the Euro as currency.  To run the script: Ensure you have Python installed on your system. Install the requests library if you haven't already: pip install requests. Copy the script into a Python file (e.g., population\_analysis.py). Run the script: python population\_analysis.py.  File name: python population\_analysis.py |