|  |  |  |  |
| --- | --- | --- | --- |
| **Qualification details** | | | |
| **Training Package Code and Title** | ICT - Information and Communications Technology (Release 8.1) | | |
| **Qualification National Code and Title** | ICT40120 Certificate IV in Information Technology (Release 4) | **State code** | BFF9 |
| **Qualification National Code and Title** | ICT50220 Diploma of information Technology (Release 2) | **State code** | BGJ4 |
| **Assessment Title** *(as per DAP)* | Assessment Task One (Individual Project) | | |
| **Unit National Code & Title** | ICTPRG443 Apply intermediate programming skills in different languages | | |
| ICTICT430 Apply software development methodologies | | |
| ICTICT449 Use version control systems in development environments | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Date Due** | Week Seven | | **Date Received** | |  | |
| **Student Name** | Tyson King | | | | | |
| **Student Declaration** | I declare that the evidence submitted is my own work:  Tyson | | | | | |
| **Assessor Name** |  | | | | | |
| **Assessment Decision** | Satisfactory | | | Not Yet Satisfactory | | |
| **Assessor Signature** |  | | | **Date** | |  |
| **Is student eligible for reassessment (Re-sit)?** | No | Yes | | **Re-assessment Date:** | | Week Twenty |

|  |  |  |  |
| --- | --- | --- | --- |
| **Feedback to student** | | | |
| *Via Blackboard (LMS) – Please check [Grade] section.* | | | |
| **Feedback from student** | | | |
| *Via Blackboard (LMS) – Please use [Comment] section during submission.* | | | |
| **Student signature** |  | **Date** |  |

|  |  |
| --- | --- |
| **Assessment Instructions** | |
| **TO THE ASSESSOR** |  |
| Type of Assessment | Individual Portfolio |
| Duration of the assessment | 7 class sessions (Weeks 1-7) |
| Location of assessment | Classroom |
| Conditions | Assessor to ensure that the noise levels, natural interactions and time variances are maintained as it would be in the Software Development industry.  Learners are required to complete the required tasks in class and submit the required documentation electronically via Blackboard |
| Elements and Criteria | As detailed in the assessment plan  You are required to make sure that all students meet the elements, performance criteria and oral communication items as outlined in the provided solution |
| **TO THE STUDENT** |  |
| Purpose of Assessment | You are required to show you can:  ICTPRG443 Apply intermediate programming skills in different languages   * Demonstrate your skills and knowledge by creating, coding, debugging and testing code * Establish user requirements and then research and collect information about data structures to provide suitable solutions. * Manage time and tasks to complete a series of coding and documentations problems   ICTICT430 Apply software development methodologies   * Select traditional and non-traditional systems development methodologies * Apply selected software methodology to project plan which identifies resources and control structures * Document analysis for approval to external stakeholders.   ICTICT449 Use version control systems in development environments   * Prepare and evaluate version control systems * Install and configure a version control system * Create and upload code to version control system * Test and review logs on version control system   The student must demonstrate the ability to complete the tasks outlined in this assessment and is expected to use systematic analytical processes and effect time management to meet the goals/deadlines outlined in the DAP. |

|  |  |
| --- | --- |
| Allowable Materials | Blackboard Topics: SDLC, Weekly readings (PDF), Example programs and Independent Outside of Class Activities |
| Required Resources | Web links and example code can be downloaded from the Blackboard portal.  PC with MS Visual Studio, MSOffice.  Internet Access to MSDN, GitHub and www.citems.com.au/ |
| Reasonable Adjustment | In some circumstances, adjustments to assessments may be made for you. If you require support for literacy and numeracy issues; support for hearing, sight or mobility issues; change to assessment times/venues; use of special or adaptive technology; considerations relating to age, gender and cultural beliefs; format of assessment materials; or presence of a scribe you need to inform your lecturer. |
| Assessment Submission | All questions and programming activities must be attempted. All written answers must be submitted in this assessment document in the appropriate space.  Use of research tools and peers in formulating answers are acceptable – but work submitted must be your own work.  Final project documentation is to be uploaded to the appropriate area in the Blackboard course created for this unit.  If you are marked as NYS (Not Yet Satisfactory) on your first attempt, you will be provided with another opportunity to re-attempt the assessment. |
| Portfolio Description | A project of programming tasks and written questions which should be completed in class and finished in the students’ own time on a weekly basis as per the Delivery and Assessment schedule.  Question 1 – Project Specifications  Question 2 – Version Control Specifications  Question 3 – UML Class Details  Question 4 – Development Methodologies  Question 5 – Methodology Analysis and Selection  Question 6 – Manage Version Control System  Question 7 – Project Plan  Question 8 – Sign off and Approval  Question 9 – Prototype Development  Question 10 – Version Control Update  Question 11 – Data Structure Matrix  Question 12 – UML Activity Diagram  Question 13 – Debug Test Report  Question 14 – Post Development Analysis  Question 15 – Demonstration and Submission |

## Scenario

You have accepted the role of a Senior Programmer for CITE Managed Services, your task is to develop a fully functional wiki application for the junior programmers. In Computer Science there are many different categories and definitions for Data Structures, most of these terms are used in the CITE software development department, however, CITE management would like to see a uniform definition and cataloguing of this information. They have supplied some basic details but would like you to complete a feasibility study and create a working prototype application. A rudimentary interface design has been provided along with a list of proposed program criteria which the prototype application must include.

Before the project can move to the next stage CITE management would like a report on the full development process and related documentation. Review the proposed program criteria and answer the associated questions. Use the supplied template forms to present your answers. Finally develop a working prototype using Microsoft Visual Studio C# and GitHub version control. The purpose of the assessment is to demonstrate to CITE management how this project can be achieved. If you do not have a GitHub account you should sign up for the free version, this will be used again in other courses (https://github.com).

You should consult with the CITE representative (Your Lecturer) if you are unsure about any of the problems or questions. Your primary research should focus on the resources on the Blackboard and CITEMS website, additional information can be collected from the Internet, ensure all sources are referenced at the end of your submission. You must write your answers in the standard templates provided in this assessment task document.

## Client Program Criteria

The client was interviewed, and the following information was recorded. The client would like the end user to select a record from a display list and then have the corresponding information displayed in four text boxes on the left side of the interface. The end user should be able to search for an item which will be displayed in the four text boxes; after the search the search input box must clear and retains focus (cursor is inside the search text box) allowing the user to search for a new term.

The client requires that the end user has the option to add/edit/delete any of the four fields associated with an individual data structure record, the four fields are: Data Structure Name, Category, Structure and Definition. The user must be prompted via a popup box during the deletion process.

The prototype must use a two-dimensional array of type string to store each record. Refer to the program criteria to determine the exact size of the array, there is no provision for additional data! A double mouse click in the name text box will clear all four text boxes and focus the cursor into the name text box.

The wiki prototype will load and save data when the appropriate button is clicked, and all the wiki data is stored/retrieved using a binary file format. During the load and save process the end user must have the option to select an alternative data file. All end user interactions must have full error trapping and feedback messaging via a status strip at the bottom of the interface.

## Suggested Interface Design (example)

Table

Description automatically generated

## Question 1 Project Specifications

You are required to create a list of all the User Requirements for the wiki prototype application. Then list all the User Interactions and Specifications of the wiki application. Fill in the relevant sections of the following Project Specifications template to answer question one.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Project Specifications | | | | | |
| Project Name | | | Database 1.0 | | |
| Date | | | 27/07/2023 | | |
| Developer Name | | | Tyson King | | |
| Client Requirements | | | | | |
| Req. # | | Description | | Importance | Notes |
| 1. | | All records to be displayed on interface | | 1 | Interface to clearly display all records |
| 2. | | All records can be added, edited and deleted | | 1 | Complete flexibility for editing record list |
| 3. | | All data to be stored in two-dimensional array of strings | | 1 | Two dimensional array’s to be used |
| 4. | | Depended of program criteria will determine size of array | | 1 | Arry may enlarge as program information grows |
| 5. | | User can double click mouse in “Data Structure Name” text box to clear all | | 1 | User can easily clear text box by adapted response |
| 6. | | Error trapping used for all user interactions | | 1 | Error trapping to be used |
|  | | *Add more lines as required* | |  |  |
| User Interaction and Specifications | | | | | |
| How will the application behave and what GUI specifications are required. | | | | | |
| 1 | Four text boxes will be used to display the following: Data Structure Name, Category, Structure, and Definition | | | | |
| 2 | Program will have an Add, Edit, Delete, Load and Save Button | | | | |
| 3 | User to have a confirmation pop up to display feedback messages | | | | |
| 4 | Status strip will be located at bottom of program | | | | |
| 5 | Double click to clear all fields and move focus to Data Structure Name Box | | | | |
| *Add more lines as required* | | | | | |

# Question 2 Version Control Specifications

CITE currently use GitHub as their primary source control; however, they would like you to investigate/research an alternative to GitHub. The purpose is to ensure CITE have chosen the best version control system for software development. Fill in the relevant sections of the following Version Control Specifications template to answer question two.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Version Control Specifications | | | | | |
| GitHub VCS | | | Alternative VCS | | |
| VCS Name: | | Git Hub | VCS Name: | | SVN |
| URL: | | https://github.com/ | URL: | | https://subversion.apache.org/ |
| Major Features | | | | | |
| List all the major features associated with each version control system (ref: https://www.softwaretestinghelp.com/version-control-software/) | | | | | |
| 1. | Helps with complex development paths that don't go in a straight line. | | 1. | Uses a setup where there's a main server and client devices. | |
| 2. | Uses a system where each copy of the code is saved in many places. | | 2. | SVK, in contrast, lets SVN have split-up branches | |
| 3. | Fits well with common ways computers communicate like HTTP, FTP, and SSH. | | 3. | Keeps track of changes in folders. | |
| 4. | Handles projects of different sizes really well. | | 4. | Tracks changes when you copy, delete, move, or rename things. | |
| 5. | Makes sure the history of changes is securely verified. | | 5. | Allows changes to be saved all at once. | |
| 6. | Can combine different parts of the code in flexible ways. | | 6. | Keeps track of versions for symbolic links. | |
| 7. | Created with a flexible toolkit design. | | 7. | Stores differences between versions of big files compactly. | |
|  |  | |  |  | |
| *Add more lines as required* | | |  | | |
| Recommendation: Which VCS would you choose and why? | | | | | |
| *Add your detailed answer here…*  I would use GitHub as firstly it is trusted by CITE, and also primary used. With its easy to use functions, and a clean interface, it allows the user to learn quickly with not much difficulty. The performance is efficient with even large programs, and allows speedy code changes in a smooth manner | | | | | |

## Question 3 UML Class Details

Create a simple UML Class Diagram for the 2D wiki data structure information. Ensure you have added the data structure and attributes. Fill in the relevant sections of the following UML Class Details template to answer question three.

|  |
| --- |
| UML Class Details |
| UML Diagram |
|  |
| Data Structure (use C# code) |
| public class DataStructure  {  // Fields to store attributes related to a data structure.  public string DataStructureName;  public string Category;  public string Structure;  public string Definition;  // Constructor to initialize the class with attribute values.  public DataStructure(string dataStructureName, string category, string structure, string definition)  {  // Assigning the provided values to the respective fields.  DataStructureName = dataStructureName;  Category = category;  Structure = structure;  Definition = definition;  } |

## Question 4 Development Methodologies

You are required to create a comparison of four (4) software development methodologies that would be suitable to create the wiki prototype application. Your comparisons must include both traditional and non-traditional system development methodologies. Complete the following Development Methodologies template to answer question four.

|  |
| --- |
| Development Methodologies |
| 1st Methodology Name: Agile |
| Description: The Agile software development methodology offers a more flexible and adaptable approach. This allows the programmer to step away from planning everything out from the beginning and instead work with smaller bits. By doing smaller bits, it allows for constant feedback to allow minor changes to be made for the process of the program |
|  |
| Advantages: Flexibility, constant feedback and adaptability |
| Disadvantages : No major structure of plan to follow, more involvement from other users |
| 2nd Methodology Name: Scrum |
| Description: The Scrum software development methodology offers a teamwork strategy that allows members to have roles and tasks to complete the program. Each member will work in short sprints to complete tasks and have constant discussion to say how they are going |
|  |
| Advantages: Working as a team brings many positive affects, constant discussions offers questions and answers between the team, frequent feedback from other members will help the program |
| Disadvantages: Does not work well with larger teams, does not support all program developments |
| 3rd Methodology Name: Waterfall |
| Description: The Waterfall software development methodology offers a more micromanaged technique where a step by step guide is set out, which the developer must complete the current step before moving to the next. |
|  |
| Advantages: A more structured plan and layout for what to do, everything is well documented and thought out |
| Disadvantages: Disallows much flexibility, any changes later on may be difficult to fix |
| 4th Methodology Name Kanban |
| Description: The Kanban software development methodology that involves a visual approach. The programmer uses physical or digital sticky notes to place on a board tasks and mark when completed |
|  |
| Advantages: Flexibility with working on tasks that may be more important or urgent, more comfort and less overload with options of choice of tasks, clearer visibility of progress |
| Disadvantages: Due to lack of structure may result in confusion, does not work well with big tasks, if programmer has bad self management skill then Kanban may not work |
| References |
| *Add references as required*  <https://www.synopsys.com/blogs/software-security/top-4-software-development-methodologies/>  <https://www.uptech.team/blog/software-development-methodologies>  https://blog.planview.com/top-6-software-development-methodologies/ |

## Question 5 Methodology Analysis and Selection

Refer back to the previous question and answer these two questions:

* What selection criteria determined your choice of the four development methodologies? Create a list of your section criteria.
* What methodology from question four would you recommend for this project? List your reasons why this is your preferred option.

Complete the following Methodology Analysis and Selection template to answer this question.

|  |
| --- |
| Methodology Analysis |
| Selection Criteria |
| When selecting a development methodology, various aspects influence the decision. Complex projects often benefit from Agile's flexible and iterative approach. For larger teams, methodologies like Scrum provide clarity with defined roles. Agile methods shine with evolving requirements, while Waterfall ensures predictability. When speed is essential, Agile's incremental nature is ideal. Agile also facilitates customer involvement and feedback. Consider resource availability, risk tolerance, change management, and scope flexibility. Kanban's visual transparency suits projects needing real-time updates. Agile's emphasis on continuous improvement aligns well with learning-focused organizations. Project environment, documentation needs, historical successes, and budget constraints all contribute to the methodology choice |
|  |
|  |
| *Add more lines as required* |
| Methodology Selection |
| Methodology Name: Kanban |
| Justification (reasons for selection) |
| **Kanban:** Kanban can be more casual and less stressful with the flexibility that it offers, giving the creator the choice of what to work on. This will benefit for a small project that has been requested. |
|  |
|  |
| *Add more lines as required* |

## Question 6 Manage Version Control System

CITE uses GitHub as the primary Version Control System (VCS), create your own GitHub account (you can use your existing account). Ensure your development computer has Visual Studio installed with all the appropriate features to create and develop a C# .Net application. Open Visual Studio and create a new project; ensure the GitHub settings have been updated to reflect your GitHub account. Create a new repository for the project and check you have both a local and remote (Cloud) instance of the repository.

Complete the following Manage Version Control System template to answer this question.

Consult with your lecturer if you wish to use an alternative source control service. Any alternative source control must support a local desktop installation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Manage Version Control System | | | | | | |
| VCS Name | | GitHub | | | | |
| Version Details | | 3.9.3 | Date | 14/08/2023 | | |
| Supported Platforms | | MacOS 10.13 or later  Windows 10 64 bit or later | | | | |
| Repository/Project Information | | | | | Yes | No |
| Has the cloud VCS account been created and named correctly? | | | | |  |  |
| Has the basic project solution been created? | | | | |  |  |
| Has the cloud VCS repository been created | | | | |  |  |
| Does the cloud VCS repository have a readme file? | | | | |  |  |
| Has the local source repository been created? | | | | |  |  |
| Are the two VCS resources linked? | | | | |  |  |
| Account Details Checklist | | | | | | |
| Repository Name: | Data Structure | | | | | |
| URL | https://github.com/TysonKing42/Data-Structure | | | | | |
| Local Source Control Screen Shot |  | | | | | |
| Cloud Screen Shot |  | | | | | |

## Question 7 Project Plan

Using your recommended development methodology from the previous question, create an initial project plan. List and describe all the tasks required to complete the development of the wiki application. Use the following Project Plan template to answer this question. Using the GitHub repository from the Manage VCS question create a Project within the repository and add your project plan.

|  |  |  |  |
| --- | --- | --- | --- |
| Project Plan | | | |
| Project Name | Data Structure | | |
| Date | 15/08/2023 | | |
| Developer Name | Tyson King | | |
| Development Tasks | | | |
| Task Name | Task Type | Task Description | Input/Output Parameters |
| Display Data Structure Records | Interface Interaction | Implement a display list where users can view available data structure records. When a record is selected, its corresponding details should populate the four text boxes on the left side of the interface. | Selected record's details in text boxes |
| Search Data Structure Records | Interface Interaction | Implement a search feature that allows users to input a term. Matching records should display their details in the text boxes. Clear the search input after displaying results and maintain focus for further searches. | Input search term  Output matching record's details in text boxes |
| Add/Edit Data Structure Record | Interface Interaction | Provide users with options to add a new record or edit an existing one. Input fields for Data Structure Name, Category, Structure, and Definition should be available. Implement validation and error handling. | Record details (Data Structure Name, Category, Structure, Definition) Output updated list of data structure records |
| Delete Data Structure Record | Interface Interaction | Allow users to delete a selected record. Display a confirmation popup box before performing the deletion. Handle potential errors, such as attempting to delete a non-existent record. | Input selected record for deletion  Output updated list of data structure records |
| Clear Text Boxes on Double Click | Interface Interaction | Implement a functionality where double-clicking the Data Structure Name text box clears all four text boxes and focuses the cursor back in the Name text box for efficient data entry. | Input double click event  Output cleared text boxes with cursor focused on Name text box |
| Load and Save Data | File Management | Create buttons to load and save data using a binary file format. Provide an option for users to select an alternative data file during loading and saving processes. | Input load/save file paths  Output loaded/saved data from/to binary file |
| Error Handling and Feedback | User Experience | Implement error trapping and display informative feedback messages through a status strip at the bottom of the interface. Messages should inform users about actions taken, errors encountered, or successful operations. | Input error conditions, successful operations  Output feedback messages in the status strip |
|  |  |  |  |
|  |  |  |  |

## Question 8 Sign-off and Approval

You will need to arrange for the previous completed questions to be reviewed by the Lecturer/Assessor for sign off, approval and feedback before you start the development.

Question 1 – Project Specifications

Question 2 – Version Control Specifications

Question 3 – UML Class Details

Question 4 – Development Methodologies

Question 5 – Methodology Analysis and Selection

Question 6 – Manage Version Control System

Question 7 – Project Plan

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Approval (Lecturer/Assessor use only) | | | | |
| Approver Name | Title | Signature | Date | Approved? |
| Stewart Godwin | Lecturer |  | 06/09/2023 | Yes |
|  |  |  |  |  |
| Lecturer Feedback | | | | |
|  | | | | |

## Question 9 Prototype Development

Create the wiki prototype to demonstrate how a collection of information can be stored using a Windows Application (WinForms). This prototype application will utilise a two-dimensional array with 12 rows and 4 columns (**use a** **simple 2D string array – not collections).** Use the hardware and software supplied in the classroom to accomplish the development, debugging and internal documentation of the prototype. Use the Version Control System from the previous Question to manage your code during the development; ensure you record these commits/branches as a series of screen shots to be included in Version Update Question (ie start, working, final). Your code must adhere to the CITEMS software development standards. (refer http://www.citems.com.au/)

**Note:** You are not permitted to use a class structure; this assessment is a demonstration of a simple 2D array of type string.

The following programming criteria and features are required, check the original project specifications for additional information.

### Programming Criteria

1. Create a global 2D string array, use static variables for the dimensions (row = 12, column = 4),
2. Create an ADD button that will store the information from the 4 text boxes into the 2D array,
3. Create an EDIT button that will allow the user to modify any information from the 4 text boxes into the 2D array,
4. Create a DELETE button that removes all the information from a single entry of the array; the user must be prompted before the final deletion occurs,
5. Create a CLEAR method to clear the four text boxes so a new definition can be added,
6. Write the code for a Bubble Sort method to sort the 2D array by **Name** ascending, ensure you use a separate **swap** method that passes the array element to be swapped (do not use any built-in array methods),
7. Write the code for a Binary Search for the **Name** in the 2D array and display the information in the other textboxes when found, add suitable feedback if the search in not successful and clear the search textbox (do not use any built-in array methods),
8. Create a display method that will show the following information in a ListView: Name and Category,
9. Create a method so the user can select a definition (Name) from the ListView and all the information is displayed in the appropriate Textboxes,
10. Create a SAVE button so the information from the 2D array can be written into a **binary file** called ***definitions.dat*** which is sorted by **Name,** ensure theuser has the option to select an alternative file. Use a file stream and BinaryWriter to create the file.
11. Create a LOAD button that will read the information from a binary file called ***definitions.dat*** into the 2D array, ensure theuser has the option to select an alternative file. Use a file stream and BinaryReader to complete this task.
12. All code is required to be adequately commented, and each interaction must have suitable error trapping and/or feedback. All methods must utilise the appropriate Dialog Boxes, Message Boxes, etc to ensure fully user functionality. Map the programming criteria (9.1 - 9.11) and features to your code/methods by adding comments above the method signatures. Ensure your code is compliant with the CITEMS coding standards (refer http://www.citems.com.au/).

**Note:** The exact requirements of the Programming Criteria are essential. Any variation from them will need to be corrected in order to achieve a satisfactory performance.

## Question 10 Version Control Update

At the conclusion of the code development record the Version Control changes, commits and pull requests with a series of suitable screen shots. Complete the following Version Control Update template to answer this question. A minimum of three screen captures is required (ie start, working, final)

|  |  |
| --- | --- |
| Version Control Update | |
| Repository Name: | Data Structure 7.1 |
| URL | https://github.com/TysonKing42/DataStructure7.1 |
| Desktop Screen Shots |  |
| Cloud Screen Shots |  |

## Question 11 Data Structure Matrix

Create test input data by researching and providing a definition for the 12 data structures listed in the Data Structure Matrix template below. The definitions must be between 20-40 words and contain real information which will be entered and saved by the wiki prototype. Add your definitions to the following Data Structure Matrix template to answer this question.

|  |  |  |  |
| --- | --- | --- | --- |
| Data Structure Matrix | | | |
| NAME | CATEGORY | STRUCTURE | DEFINITION |
| Array | Array | Linear | An array is a data structure that stores a collection of elements, like a list. Each element in an array is identified by its unique index or position in the collection. This makes it easy to access and manipulate individual elements within the array. |
| Two Dimension Array | Linear | A two-dimensional array is like a regular array, but it's organized in rows and columns. It's used to store data in a grid-like format, which is handy for representing things like matrices or tables. |
| List | List | Linear | A list is a flexible data structure that can change in size as you add or remove elements. Unlike arrays, lists don't have a fixed size, making them more versatile for managing collections of items. |
| Linked list | Linear | A linked list is another way to organize and store data. In a linked list, elements are stored as nodes, and each node has a reference to the next node in the list. This structure allows for efficient insertions and deletions. |
| Self-Balance Tree | Tree | Non-Linear | A self-balancing tree is a type of binary tree that automatically reorganizes its nodes to maintain balance, ensuring that the tree remains efficient for operations like searching, insertion, and deletion. |
| Heap | Non-Linear | A heap is a specialized tree-based data structure that satisfies the heap property. It's often used to implement priority queues and efficiently find the maximum or minimum element in a collection. |
| Binary Search Tree | Non-Linear | A binary search tree is a binary tree where each node has at most two child nodes, and the left subtree of a node contains only values less than or equal to the node's value, while the right subtree contains values greater than the node's value. This structure allows for efficient searching. |
| Graph | Graphs | Non-Linear | A graph is a collection of nodes (vertices) connected by edges. Graphs can represent complex relationships between elements, and they come in various forms, such as directed and undirected graphs. |
| Set | Abstract | Non-Linear | A set is a data structure that stores a collection of unique elements. It's useful for tasks that involve eliminating duplicate values or checking for membership in a distinct set of items. |
| Queue | Linear | A queue is a linear data structure that follows the First-In-First-Out (FIFO) principle. Elements are added to the back, or "enqueue," and removed from the front, or "dequeue," making it suitable for tasks like task scheduling and order processing. |
| Stack | Linear | A stack is a linear data structure that follows the Last-In-First-Out (LIFO) principle. Elements are added and removed from the top of the stack, making it useful for tasks like managing function calls or tracking state changes. |
| Hash Table | Hash | Non-Linear | A hash table is a data structure that uses a hash function to map keys to values. It provides efficient access to data by allowing quick retrieval based on key values. |
| References | | | |
| *Add references as required)":*  *https://www.geeksforgeeks.org/binary-search-tree-set-1-search-and-insertion/*  *https://www.geeksforgeeks.org/heap-data-structure/*  *https://www.geeksforgeeks.org/binary-search-tree-ds/*  *Khan Academy - "Graph representation": https://www.khanacademy.org/computing/computer-science/algorithms/graph-representation/a/describing-graphs*  *https://www.geeksforgeeks.org/set-in-cpp-stl/*  *https://www.tutorialspoint.com/data\_structures\_algorithms/dsa\_queue.htm*  *https://www.geeksforgeeks.org/stack-data-structure/*  *https://www.geeksforgeeks.org/hashing-data-structure/* | | | |

## Question 12 UML Activity Diagram

Create a detailed UML Activity Diagram for the Binary Search method. Start by copying your C# code into the right side of the UML Activity Diagram section, then add your UML Activity Diagram in the left side. Now, using the code and the UML diagram identify breakpoints so all major pathways are tested. Update the C# Code on the right section to identify the breakpoints. The example in the appendix is provided for clarification. Complete the following UML Activity Diagram template below.

|  |  |
| --- | --- |
| UML Activity Diagram | |
| Diagram | C# Code |
| **Create your UML activity Diagram here** | **Copy of your Binary Search Code here**  private int BinarySearch(string targetName)  {  int low = 0;  int high = recordCount - 1;  while (low <= high)  {  int mid = (low + high) / 2;  int compareResult = string.Compare(dataRecords[mid, 0], targetName);  if (compareResult == 0)  {  return mid; // Found the record  }  else if (compareResult < 0)  {  low = mid + 1; // Search in the right half  }  else  {  high = mid - 1; // Search in the left half  }  }  return -1; // Not found  } |

## Question 13 Debug Test Report

Using the breakpoints shown in the previous Question as a starting point, utilise the debug features to debug, trace and test your Binary Search code. Ensure your code is error free and functions correctly (refer Programming Criteria) record and correct any errors. Your Debug Test Report must include appropriate evidence that your code functions as expected (references to screen captures). Complete the following Debug Test Report template below.

* Ensure you have entered 12 records from previous Question before you begin testing,
* Place a break point at each Decision and Loop construct and record the data as it changes,
* Use a test data item that will be found (ie Stack),
* Use a test data item that will not be found (ie ArrayList).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Debug Test Report | | | | | | | | | | |
| Project Name | | Data Structure | | | | | | | | |
| **Method** | | Manual Testing | | | | | | | | |
| **Description** | | Testing functions on binary search to find index in Array | | | | | | | | |
| **Level of Testing** | | Unit Testing | | | | | | | | |
| **Developer** | | Tyson King | | **Tester** | Tyson King | | **Date** | | 10/09/2023 | |
| **Test Case No** | **Test Case Name** | | **Test steps** | | | **Test Data** | | **Expected result** | | **Pass / Fail** |
| 1 | Confirm target found for binary search | | 1. Enter “Stack” in binary search text box 2. Set breakpoint to “int low =0;” “int high = recordCount – 1;” “while (low <- high)” “return -1;” 3. Search for “Stack” | | | 1. Target: "Stack"  2. Records: [List the 12 records with various data] | | Record found | | Pass |
| 2 | Confirm target not found for binary search | | 1. Enter “ArrayList” in binary search text box 2. Set breakpoint to “int low =0;” “int high = recordCount – 1;” “while (low <- high)” “if (compareResult == 0) 3. Search for “ArrayList” | | | 1. Target: "ArrayList"  2. Records: [List the 12 records with various data excluding "ArrayList"] | | Record not found | | Pass |
| 3 |  | |  | | |  | |  | |  |
| 4 |  | |  | | |  | |  | |  |
| 5 |  | |  | | |  | |  | |  |
| 6 |  | |  | | |  | |  | |  |
| 7 |  | |  | | |  | |  | |  |

## Test one Screenshot

## A screenshot of a computer Description automatically generated

## Test two Screenshot

## A screenshot of a computer Description automatically generated

Test three Screenshot

## Question 14 Post Development Analysis

Once you have completed coding and testing of this prototype application you can answer the following questions and complete the Post Development Analysis section in the template below.

1. What Software Development Life Cycle did you use during the development of the Prototype Application?
2. How effective was your project plan in developing the final prototype?
3. What alternative data structures could be used?
4. What constructive advice could you provide for the development of a similar project?

|  |
| --- |
| Post Development Analysis |
| Questions |
| What SDLC did you use during the development of the Prototype Application?  Kanban |
| How effective was your project plan in developing the final prototype?  My SDLC choice was effective as it allowed me to focus on certain feature and did not involve a strict project planning criteria. This allowed me to focus on tasks with freedom. My project planning worked, despite common changes being made throughout the process of completion of the application |
| What alternative data structures could be used?  Instead of using the two dimensional array as requested, a custom class could be used to represent each record. Using a getters and setters will a more secure data structure allowing limited access to the classes and more flexibility for if the program was needed to be developed at a larger level |
| What constructive advice could you provide for the development of a similar project?  To be mindful of possible changes and that the pre development of the program will not signify the final copy. As you progress in the creation of the program more changes than initially thought about will occur. Allowing flexibility of this will help with a healthier development |

## Question 15 Demonstration and Submission

Demonstrate your working program to your lecturer using the realistic data from the previous Question. Ensure your code is fully commented with your Name, ID, Date, Assessment Task placed above the workspace header. Ensure all the documentation has been completed and is ready for inspection.

**Note:** All documentation must use the supplied templates/forms.

**Submit the zipped solution folder with relevant documents to Blackboard**

End of Assessment Task One

## Appendix

Diagram

Description automatically generated