| **logobw**  CANDIDATE NAME  CT GROUP | VICTORIA JUNIOR COLLEGE  JC 2 COMMON TEST  Higher 2 n  **……………………………………………….…………..**  **……………………………..** | | | |
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| **COMPUTING** | | | **9569/01** | |
| **Paper 1** | | | | **27 June 2023**  **2 hours** |
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| **READ THESE INSTRUCTIONS FIRST**  Write your name and CT group on all the work you hand in.  Write in dark blue or black pen.  You may use a soft pencil for any diagrams, graphs or rough working.  Do not use staples, paper clips, highlighters, glue or correction fluid.  The use of an approved scientific calculator is expected, where appropriate.  The number of marks is given in brackets [ ] at the end of each question or part question.   | For Examiner’s Use | | | --- | --- | | Total | **/ 65** | | | | | |
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|  | This document consists of **5** printed pages and **1** blank page. |  |

1. A binary search tree can be represented as a number of nodes each containing an item of data and a left pointer to the left sub tree and a right pointer to the right sub tree. A pointer Root indicates the root node.

Consider the following binary tree with nodes containing the name of a fruit:

A picture containing diagram, line, plan, font

Description automatically generated

1. List the nodes, in order, that are visited for a post-order traversal. [2]
2. List the nodes, in order, that are visited for an in-order traversal. [2]
3. State the property exhibited by the list of items produced in part **(b)**. [1]
4. Using pseudocode, write a recursive procedure to perform a binary tree search on a given fruit. The output should state whether the fruit is present in the tree. [5]
5. The following recursive function checks if a string is a palindrome. It returns TRUE if the string is a palindrome and FALSE if otherwise.

01 FUNCTION check\_palindrome(string, first, last):

02 IF first = last THEN

03 RETURN TRUE

04 ELSE

05 IF string[first] <> string[last] THEN

06 RETURN FALSE

07 ELSE

08 RETURN check\_palindrome(string, first+1, last-1)

1. State **three** features of a recursive function. [3]
2. State the line number that indicates the function is recursive. [1]
3. Explain how a stack is used when a recursive call is made. [4]
4. There is an error in this algorithm causing an incorrect result.
   1. Describe the error. [2]
   2. State and explain the change required to correct this error. [2]
   3. Name the type of error identified in your answer to part **d(i)**. [1]
   4. Design **three** appropriate test cases which could be used to test the algorithm. [3]

1. When data is first entered into the system, it is validated and verified.
2. Explain the difference between data validation and data verification. [2]
3. State a method of verification and describe the purpose of this verification method. [2]
4. A check digit is an extra digit added to the end of a code number, which has been calculated from the digits of the code number.

The use of check digit is one validation technique.

1. State and describe **two** other validation techniques. [2]
2. Describe **two** types of error that check digits usually detect. [2]
3. Give **two** reasons why the data type of a field storing the code number with its check digit should be a string rather than an integer. [2]
4. The Internet consists of interconnected networks using the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite.
5. State **two** layers of the TCP/IP protocol suite. [2]
6. Give **two** reasons why TCP/IP protocol suite have layers. [2]
7. Explain the main difference between a Local Area Network (LAN) and a Wide Area Network (WAN). [2]
8. A company has its central headquarters based in Singapore. It has now established a branch in Malaysia. The company also allows its employees to work from home.

Describe with the help of a simple network diagram, how employees from the Malaysia branch and at home can access the central headquarters’ servers. [6]

1. The Simple Mail Transfer Protocol (SMTP) is an Internet standard communication protocol for electronic mail transmission. Mail servers and other message transfer agents use SMTP to send and receive mail messages from the clients.
   1. Describe **one** disadvantage of such client-server architecture. [1]
   2. Denial-of-Service (DOS) attacks are some the most commonly occurring security issues in email transmissions.

Describe how DOS attacks can disrupt the normal operation of an SMTP server. [2]

* 1. Describe **one** security control or protection scheme that a company can deploy to minimise the chances of DOS attacks on the SMTP server. [2]
  2. Apart from deploying various security controls, state **two** codes of conduct that computing professionals must uphold to protect the company from cyberattacks. [2]

1. You are tasked to create a relational database for a bus company. After discussion, your team concludes that the database requires six tables: BUS, DRIVER, SCHEDULE, ROUTE, STOP, ROUTE\_STOP.

Each driver is assigned to a unique bus number. Therefore, the driver’s unique ID, name, and his assigned bus number needs to be stored.

Each bus has a unique number and can be assigned to more than one driver. Each bus runs on a s hedule. The bus’ last maintenance date must also be updated to ensure all the buses are maintained regularly.

A schedule includes the bus number, departure, and arrival time, as well as a specific route.

Just like each schedule is recognised by a unique ID, each route is also identified by a unique number. A route refers to a defined path or course that a bus follows to reach its destination. It is a predetermined itinerary that specifies the sequence of stops and the roads or streets that the bus will travel along. For each route, the company can dictate its fare.

Each bus stop is also identified by a unique bus stop number and the name of the street it is located at.

1. Draw an Entity-Relationship (E-R) diagram showing the **six** tables and the relationships between them. [5]
2. Explain, in terms of database normalisation, why there is a need to have a table called Route\_Stop. [2]
3. Based on the above information, write the table descriptions for the tables BUS, DRIVER and SCHEDULE, each of which is in third normal form (3NF).

The primary key is indicated by underlining one or more attributes. The foreign key is indicated by drawing a dashed line below one or more attributes. [3]

**End of Paper**

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