| NAME | CLASS | INDEX NO. |
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| MARKING SCHEME | | |

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ST. PATRICK'S SCHOOL PRELIMINARY EXAMINATION 2021

| SUBJECT | : | Computing Paper 1 (7155/01) | DATE : | 23 August 2021 |
|---------|---|--------------------------------|------------------|----------------|
| Level | : | Secondary 4 Express | DURATION: | 2 hours |

Candidates answer on the Question Paper.

INSTRUCTIONS TO CANDIDATES:

Write your Name, Class and Index No. in the spaces at the top of this page. Write in dark blue or back pen. You may use a soft pencil for any diagrams or graphs. Do not use staples, paper clips, glue or correction fluid.

Answer all the questions.

The use of an approved scientific calculator is expected, where appropriate. You are reminded of the need for clear presentation in your answers.

The number of marks is given in brackets [] at the end of each question or part question. The total number of marks for this paper is 80.

INFORMATION FOR CANDIDATES:

The allocated marks for each question are indicated in the brackets [].

| For Examiner's Use | |
|--------------------|-----|
| Score | /80 |

This question paper consists of 14 printed pages, including the cover page.

Draw **one** line from each item to its appropriate description.



- 2 A software company is creating an online learning portal for adult learners.
 - (a) The user must first register an account in the portal. The user will then receive a verification email. Upon successful verification, the user can now login to the portal.

In the portal, a registered user will be able to access the profile page where he/she can edit his/her personal information, email address, password and profile picture.

The user can also access the courses page where he/she can view the details of the various courses available and select the courses that he/she wishes to enroll. Upon enrolling into a course, he/she can access the course materials and the portal will automatically track his/her learning progress.

During the planning stage, the problem must be decomposed into smaller, more manageable parts called modules.

Identify and describe two of these modules.

(b)

| 1 Registration module – describe the function | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2 Courses module – describe the function. Any other valid answer. | |
| [] | 2] |
| Another team in the company is responsible in creating a detective strategy game where the player assume the role of a detective. In one part of the game, the detective can access the files of the suspects. | |
| Identify two common elements between this game and the learning portal described in part (a) . | |
| 1 Generalise the Course module for the implementation of the File Access module. | |
| 2 Generalise the Registration module for the implementation of the Player | |
| Registration module. | |

[2]

3 Consider the following algorithm.

```
01 Ratio_1 = 0
02 Ratio_2 = 0
03 INPUT Bigger_Num
04 INPUT Smaller_Num
05 Ratio_1 = ROUND(Bigger_Num/Smaller_Num, 3)
06 Ratio_2 = ROUND((Bigger_Num + Smaller_Num)/Bigger_Num, 3)
07 IF Ratio_1 == Ratio_2 THEN
08 OUTPUT True
09 ELSE
09 OUTPUT False
09 ENDIF
```

(a) Complete the following trace table for the algorithm.

Use the data Bigger Num = 61.84, Smaller Num = 38.22 as input.

| Bigger_Num | Smaller_Num | Ratio_1 | Ratio_2 | OUTPUT |
|------------|-------------|---------|---------|--------|
| | | 0 | | |
| | | | 0 | |
| 61.84 | | | | |
| | 38.22 | | | |
| | | 1.618 | | |
| | | | 1.618 | |
| | | | | True |

(b) The algorithm does not include validation on the inputs.

Name and describe one validation check that could be added to validate the inputs.

Format check or Presence check or Range check with the necessary description.

- e.g. format check on float data type. If non-float or non-integer data is entered, the
- program should display the appropriate error message to enter a float data type and ask
- the user to enter the correct data again.

4

| (c) | Decide on the data validation technique you would used in the algorithm and give a reason on your decision. | |
|-----|------------------------------------------------------------------------------------------------------------------------------------------|-----|
| | Try again so that the user can enter the correct data without having to run the program | |
| | from the start. | 101 |
| | | [2] |
| (d) | For each of the following test case conditions, give one example of the test data that you would use to test the above algorithm. | |
| | Normal Test Case | |
| | Example of any integer or float test cases | [1] |
| | Error Test Case | |
| | Example of wrong data type | [1] |
| | Boundary Test Case | |
| | | |

4 In general, there are five stages in developing a program.

For each of the following stages, describe the **goal** of the stage and describe **one** task that can be done during that stage.

Division by 0 input or negative number, same numbers, incorrect range of number [1]

Gather Requirements Stage

- The goal of this initial stage is to determine the nature of the problem, why a program is Goal needed and what the program is expected to do. If this stage is not performed properly, it is likely that any program that is developed will not actually solve the problem.
- Interviewing the intended audience of the program to understand the nature of the Task problem or their expectations
 - Identifying the complete set of inputs that is necessary to define the problem and how the inputs can be supplied to the program being developed
 - Identifying the complete set of outputs that is necessary to solve the problem and the format for the output

Plan Solutions Stage

| Goal | The goal of this stage is to consider the options available before any code is written, |
|------|-----------------------------------------------------------------------------------------|
| | and to choose an algorithm based on the resources available (such as manpower and |
| | time). |

- Task Manually solving different simplified examples of the problem and generalising the [4] steps needed to produce the required output
 - Trying different ways to break down the problem into smaller parts such that the intended output of each part gets closer and closer to what is needed to solve the problem
 - Comparing the problem (or its smaller parts) to other problems that have been solved before and identifying which algorithms can be used
 - Estimating the amount of effort needed to write the code or the time needed to complete the algorithm before making a definite choice
 - Writing possible algorithms using either flowcharts or pseudo-code

5 When we use a programming language, the source code must be translated into machine code before it can be run. Source code can be translated by a compiler or an interpreter.

Describe **one** advantage that a compiler has over an interpreter and **one** advantage that an interpreter has over a compiler.

Advantage of a compiler

- The resulting program runs at a faster speed because all the translation has been done beforehand.
- The compiler is not needed to run the program aftercompilation is complete.
- Syntax errors are detected before the program is even run.

Advantage of an interpreter

- Changes to the source code take effect immediately.
- Interpreters usually offer an interactive mode, which facilitates learning and experimentation.

[2]

- 6 A new multinational company sets up its main headquarters in Country A and establishes another office in Country B.
 - (a) State the type of network that would be suitable to enable the office in Country B to share information with its main headquarters in Country A.
 - Wide Area Network (WAN) [1]
 - (b) The office in Country B uses a Local Area Network (LAN) where both wired and wireless connections are used to connect the different computers and other network devices.

Describe **two** possible **examples** with **reasons** why the office in Country B uses both wired and wireless connections.

| Factor | Wired | Wireless |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cost | Lower as equipment and cables are cheaper | Higher as wireless networking equipment is more expensive |
| Speed of transmission and bandwidth | Faster and higher bandwidth as cables provide dedicated connection | Generally slower and lower bandwidth due to possible interference from radio waves or microwaves; varies according to user location in relation to network |
| Reliability | More reliable as data transmission is unaffected by interference | Less reliable due to potential interference from radio waves and microwaves or blockage from physical obstructions |
| Security | More secure as the network is less susceptible to interception and hacking | Less secure due to possible intrusion by hackers |
| Mobility of users | Lower as network connections are fixed at specific spots and users cannot move to other locations | Higher as users can move about freely within the range of the wireless network |
| Scalability | More cumbersome to add new devices to the network as physical constraints and the running of cables need to be considered | Easier to add new devices to the network as the router can be easily configured |
| Physical organisation | Tends to look more disorganised due to cables running across floors | More organised without cables |

For example, the company would have mobile workstations or network printer. Therefore, a wireless connection would allow the users to work freely within the range of the network. [4]

For example, the company would require a dedicated wired connection to the file server so that the transmission is faster and bandwidth is higher Complete the trace table for the following data.

589, 590, 580, 592, 591, 599, 600, 592

Trace table

| Accepted | Rejected | Canned | OUTPUT |
|----------|----------|--------|--------|
| 0 | 0 | | |
| | | 589 | |
| 1 | | | |
| | | 590 | |
| 2 | | | |
| | | 580 | |
| | 1 | | |
| | | 592 | |
| 3 | | | |
| | | 591 | |
| 4 | | | |
| | | 599 | |
| 5 | | | |
| | | 600 | |
| | 2 | | |
| | | 595 | |
| 6 | | | |
| | | | 6 2 |

(d) From the flowchart in (c), identify one variable and one constant.

| (i) | Variable | Accepted, Rejected, Canned |
|-----|----------|----------------------------|
| | Constant | LIMIT |

[2]

(ii) State the difference between a variable and a constant.

A variable is a name with an associated value that can be changed while the program is running but a constant is a name with an associated value that usually cannot be changed while the program is running.

[2]

(e) Study the flowchart in (c). There is a need to calculate and output the average weight of each box. Describe the changes required to the algorithm, making the necessary references to the flowchart.

Initialise the variables for average (Avg) and total weight of box (Total). After INPUT Canned box, add Canned value to Total. Before the OUTPUT box, calculate Avg by dividing Total by Accepted. In the OUTPUT box, include Avg.

[3]

[2]

[1]

7 Cyberattacks are intentional attempts to damage, disrupt or gain unauthorized access to one or more computer systems through the Internet. Financial institutions are very wary of phishing and pharming attacks.

(a) State two tell-tale signs to identify phishing emails.

- The email claims to be from a company or bank and asks for personal data or confidential information. Most companies or banks will never ask for such information via email. When in doubt, call the company or bank to verify.
- The email uses a generic greeting such as "Dear Customer" or "Dear User". This is a sign that the email was sent automatically and not by a person.
- The email has inaccurate logos or grammatical and spelling errors that suggest it is not from a legitimate source.
- The email seems to come from a fake sender or from an address or contact that does not match the supposed source of the email. Fake senders usually use email accounts from free providers such as Gmail and Yahoo or from sites made up of random letters or common misspellings of legitimate sites.
- The email contains hyperlinks with destinations that do not match what the hyperlink text says or are otherwise unexpected. To check the actual destination of a hyperlink, place your mouse cursor over the hyperlink and its destination will usually appear either as a pop-up or on the status bar.
- The tone of the email or chat is excessively urgent or threatening. Phishers often use such scare tactics to make victims act before they can think through their actions properly. Alternatively, the email may promise an offer that seems too good to be true. This is to tempt victims into revealing their personal information.

(b) Explain **one** measure that can be taken to protect against pharming.

- Ensure that public key encryption (see section 7.2.2.3) is used when submitting credit card or
 other sensitive information via the Internet. Clicking on the padlock icon that appears
 beside the address bar usually displays more information to verify that the recipient is
 legitimate and that encryption is working correctly.
- Regularly check bank, debit/credit card and other statements to ensure all transactions are legitimate.
- Regularly update web browsers and the software running on network devices so that all known bugs are fixed.
- Make sure that two-factor authentication (see section 7.2.1.2) is enabled for all bank transactions. This ensures that even if an attacker is able to access the bank account, no unauthorised transactions can take place as the attacker would not be able to provide the required OTP.

8 Complete the following paragraphs by filling in the missing words.

When Person A takes Person B's work and submit it as his/her own work without Person B's permission, Person A has committedcopyright...... infringement andplagiarism......

| There are also laws against the crime of copying, distributing | and/or using proprietary software |
|-------------------------------------------------------------------|-----------------------------------|
| illegally, also called softwarepiracy | . We should be wary if the |
| software we are installing requires a program called | crack that |
| modifies proprietary software so that it cannot detect that it is | being used illegally. |

- 9 With the advent of technology, the healthcare industry has underwent many changes.
 - (a) Give two positive impacts of using technology in healthcare.
 - 1 On the positive side, technology has enabled telemedicine, which is the use of video conferencing and other technology, for doctors to provide medical consultations and diagnoses over the Internet. This gives patients who are located in remote places or have limited mobility better access to healthcare.
 - 2 Technology has created new areas of growth in the healthcare industry, such as the provision of telemedicine solutions to existing healthcare businesses. In particular, many of these solutions provide a way for patients to securely transfer potentially sensitive medical information over the Internet.

The rise of 3D-printing technology has also opened up new opportunities in the building and customisation of prosthetic limbs, hearing aids and dental fixtures.

- (b) Give two negative impacts of using technology in healthcare.
 - 1 On the negative side, some patients find the use of robots and other technology in healthcare impersonal and mistrust the ability of machines to provide proper healthcare. Other patients may misuse information from the Internet and make potentially dangerous decisions based on incorrect diagnoses.
 - 2 There is also an increased focus in automating healthcare processes through the use of robots to dispense medicine and other more menial tasks. This may in turn cause such jobs to disappear from the job market.

[2]

[2]

[4]

| 10 | Data on th | a corruption and loss can happen due to human error. For example, multiple users working ne same file may accidentally overwrite each other's data. | |
|----|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| | (a) | Identify one way to prevent data corruption and loss due to overwriting errors. | |
| | | Set up rules when collaborating with multiple users to prevent them from writing to the same file at the same time. | F41 |
| | (b) | Administrators often use file permissions settings on operating systems to manage user access and rights to a particular data. | [1] |
| | | State one reason why this access control measure may still not prevent unauthorised access. | |
| | | - Unfortunately, managing permissions and administrative rights can be a complex task and it is possible to unintentionally grant access to a file or administrative rights to an unauthorised user | |
| | | In addition, authentication for the administrator must be especially strong, as an intruder that successfully claims to be the administrator can bypass file permissions entirely. | |
| | | - File permissions also do not prevent an intruder with physical access to a storage device from accessing files or folders directly without going through the operating system. To prevent such unauthorised access, it is necessary to use encryption | |
| | | | [1] |
| 11 | (a) | Convert the positive denary number 63 into an 8-bit binary number. Show your working clearly. | |
| | | 0011 1111 with correct working | |
| | | Answer | [2] |
| | (b) | Convert the binary number 1010 0001 into its hexadecimal equivalent. Show your working clearly. | |
| | | A1 with correct working | |
| | | Answer | [2] |
| | (c) | State two examples where hexadecimal is used to represent binary. | |
| | | 1 | |
| | | 2 | [2] |

(d) Describe how the binary number **0101 1110** is converted into a positive whole denary number. Give the denary value in your answer.

| To convert a binary number to its denary equivalent, we add up the product of each digit and its place value. | |
|---------------------------------------------------------------------------------------------------------------|-----|
| Show correct working. | |
| | |
| | |
| | |
| | |
| Denary value 94 | [4] |

12 (a) Identify the logic gate that the following truth table represents.

| Α | В | X |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

AND gate [1]

(b) Complete the following truth table to represent a **NAND** gate.

| Α | В | Х |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

[1]

(c) Draw a logic circuit to represent the following Boolean statement. All logic gates must have a maximum of **two** inputs. Do **not** simplify the Boolean statement.

 $\mathbf{X} = (\text{NOT } \mathbf{A} \text{ AND } (\mathbf{B} \text{ NOR } \mathbf{C})) \text{ OR } (\mathbf{C} \text{ AND } \mathbf{B})$



(d) Complete the truth table for the Boolean statement:

|--|

| Α | В | С | Working Space | X |
|---|---|---|---------------|---|
| 0 | 0 | 0 | | 1 |
| 0 | 0 | 1 | | 0 |
| 0 | 1 | 0 | | 0 |
| 0 | 1 | 1 | | 1 |
| 1 | 0 | 0 | | 0 |
| 1 | 0 | 1 | | 0 |
| 1 | 1 | 0 | | 0 |
| 1 | 1 | 1 | | 1 |

[5]

- **13** A binary comparison module is programmed.
 - A 12-bit binary number is hard-coded into the source code.
 - The user inputs a 12-bit binary number to compare with the above stored binary number.
 - If it is a match, the module outputs "Pass".
 - If it is not a match, the module outputs "Fail. Try Again.".

Write an algorithm, using pseudo-code, program code or a flowchart, for the above module.

| - Initialise 12-bit binary number [1] | |
|------------------------------------------------------------------------|------------|
| - User input [1] | |
| - Conditional statement to check for match and appropriate message [3] | |
| - Loop management if no match and prompts user to enter again [2] | |
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| [5 | i] |

13

End of Paper

