Section A	Short Answer Questions	30 Marks

Answer any 9 of the 12 questions.

Question 1

(a) Define the term local area network (LAN)

(b) State two advantages of connecting computers together in a LAN.

1
2

Question 2

Table 1 shows information on two standard character sets.

Character Set	Bit length
ASCII	8
Unicode	32

Table 1

(a) How does bit length affect the size of the character set.

(b) Mary claims that Unicode can represent more than 4 times the number of characters that ASCII can, Is she correct? Explain your answer.

Question 3

(a) Define the term embedded system.

(b) Explain the main difference between analogue and digital signals.

1. Analogue signals
2. Digital signals

(c) Which of the signals below represents an analogue signal and a digital signal.

A B

A :
B:

Question 4

James works from home; his computer has a MAC address.

(a) Explain what is meant by a MAC address.

(b) Identify two benefits of using layers when working with networking protocols.

Question 5

A robot moves on a checkerboard as shown in **Figure 1.**

A function telling the robot how to move is shown in **Figure 2.**

This function is part of a larger flow chart.

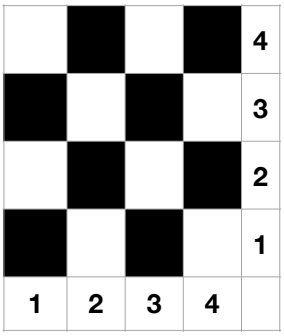


Figure 1

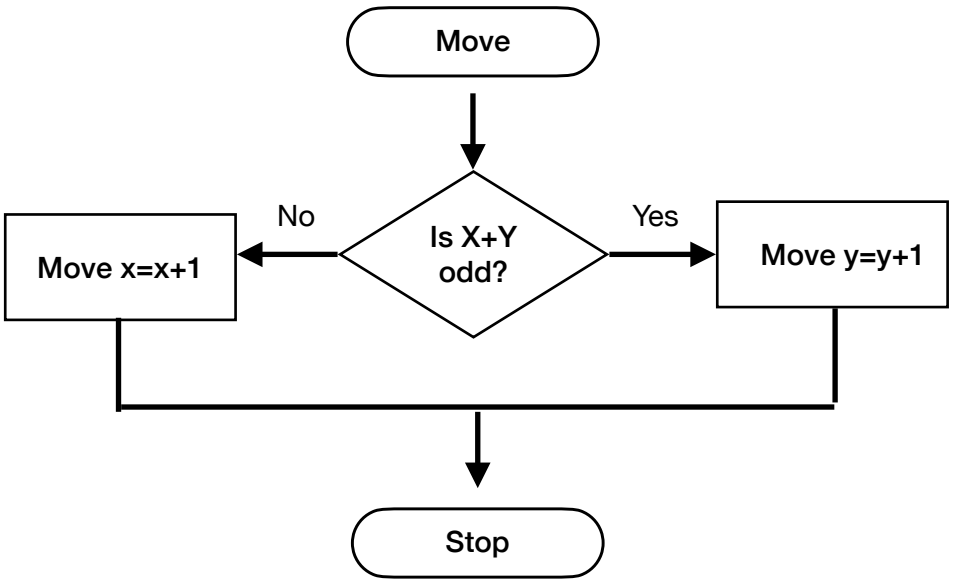


Figure 2

The robot starts at position (1,1) and currently stops after one iteration of the code. Draw a flowchart to show how the robot moves. The flowchart should:

1. Ask the user to enter which square the robot starts on
2. Run the function ‘Move’ in a loop.
3. Stop when the robot reaches the top or the right of the board.

Question 6

Complete the truth table below for the logic circuit shown in **Figure 3**.

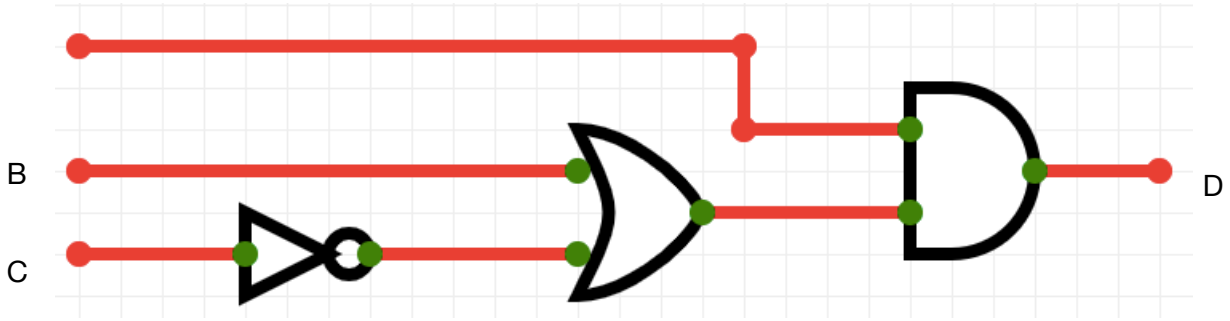


Figure 3

Inputs			Output
A	B	C	D
0	0	0	
1	1	1	
1	0	0	
0	0	1	
0	1	1	

Question 7

(a) What is meant by the term ‘relational database’?

(b) A company, ‘Computers-R-Us', has two tables in their database: *Customer Details* and *Sales Transactions.*

How can a primary key in the *Customer Details* table be used to find information on the sales transaction of a particular customer?

(c) Give an example of a valid primary key that could be used in the *Customer Details* table.

Question 7

Computers can encounter overflow when adding binary numbers.

(a) Give an example of an 8-bit binary addition where an overflow occurs.

(b) Convert the binary number **01101010** to decimal.

(c) Convert the hexadecimal number **3AC** to decimal.

Question 8

(a) Explain the difference between RAM and ROM.

RAM
ROM

(b) In the context of CPU architecture, explain the term ‘core’.

Question 9

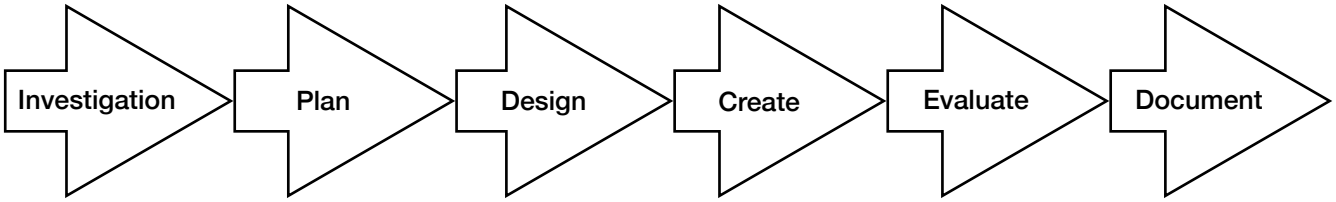


Figure 4

Figure 4 identifies some of the main stages of a software development design process. Describe briefly what happens at the following stages of the design process.

(a) Investigation stage

(b) Evaluation stage

Question 10

The 7 Principles of Universal Design were developed in 1997 by a working group of architects, product designers, engineers and environmental design researchers. Their aim was to develop a design process for creating products that are accessible to people with a wide range of abilities, disabilities, and other characteristics

(a) Identify two different Principles of Universal Design and explain how they have been applied to a product, either software or hardware.

(b) Explain, with an example, how have the Principles of Universal Design have played a role in the development of adaptive technology that can play a role in the lives of people with special needs.

Question 11

Websites such as '*haveibeenpwned.com'* act as a database where users can check if their details have been leaked online due to breaches in security in companies such as Sony or Adobe. The database is a list of sorted information containing details such as a users email and if that email has been released as part of a breach.

(i) A linear search algorithm would take a long time to run on such a large database, name one other search algorithm you have studied?

(ii) Explain if the algorithm you identified in part (i) would be suitable for use to search this database.

(iii) Explain how the algorithm you identified in part (i) operates, clearly identifying what variables you would use when creating the algorithm.

Question 12

Figure 2 shows and example of the client-server model of computing.

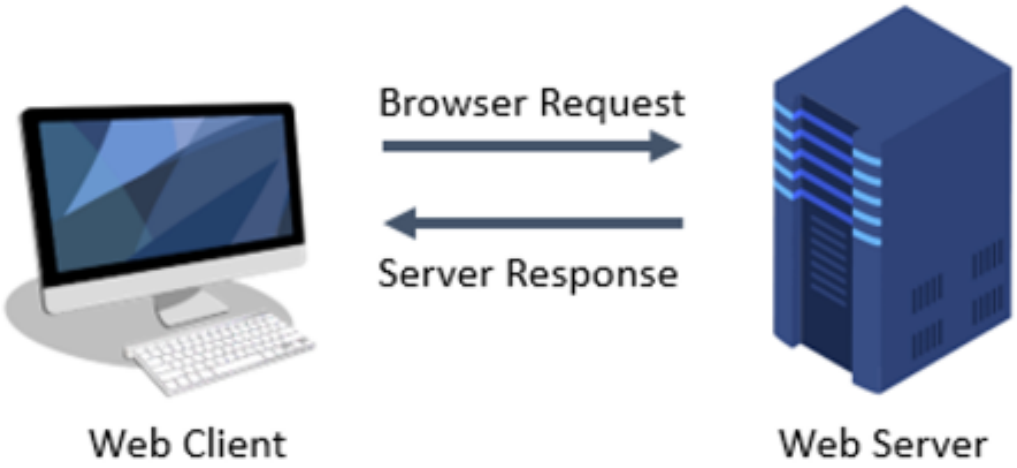


Figure 2

(a) Explain the client-server model in computing. In your answer you should reference the terms included in **Figure 2.**

(b) Differentiate between HTTP and HTTPS

Section B	Long Questions	30 Marks

Answer any two questions.

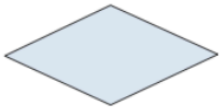
Question 13

Modules are an important concept in computer programming. A module is a file containing Python definitions and statements that can be imported into another Python script.

a) (i) Name **one** advantage of using modules when creating a software.

(ii) Give **two** examples of modules you have used in the Python programming in your course and explain briefly why you used them.

b) Flowcharts and pseudocode are useful tools to visualise how computer programs operate.

Symbol	Name	Function
	Start/end	An oval represents a start or end point
	Arrows	A line is a connector that shows relationships between the representative shapes
	Input/Output	A parallelogram represents input or output
	Process	A rectangle represents a process
	Decision	A diamond indicates a decision

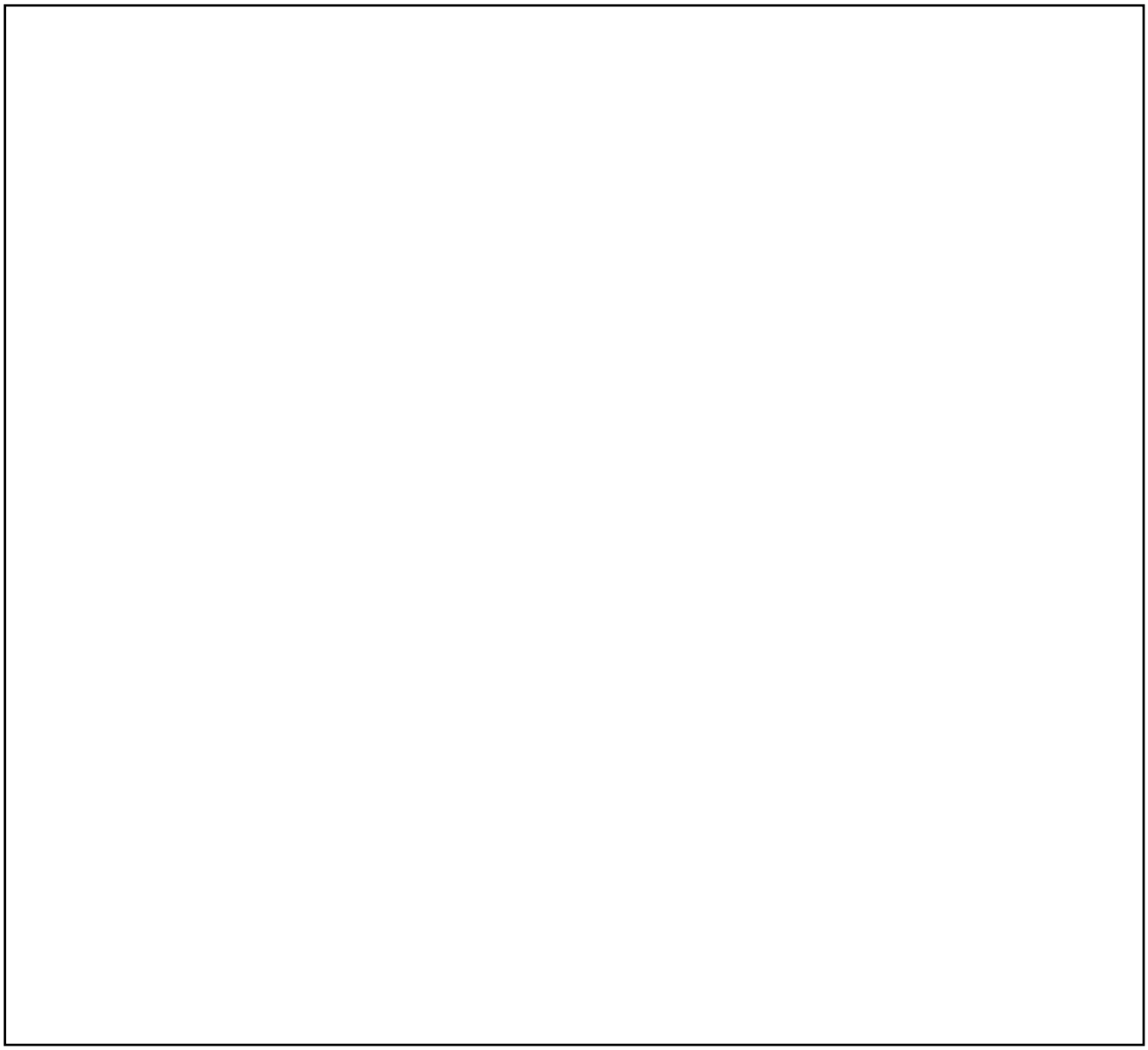
(i) Using the flowchart symbols above **create a flowchart** for the following task.

A software engineer wishes to create a program that will generate Eircodes for houses in a new estate. An Eircode is a seven-character alpha-numeric postcode. Each Eircode is unique to a postal address and its geographic location. Each Eircode takes the form of:

1st Character	2nd Character	3rd Character	4th Character	5th Caharacter	6th Character	7th Character
Letter (a-z)	**Number** (0-9)	**Number** (0-9)	**Letter** (a-z)	**Number** (0-9)	**Letter** (a-z)	**Number** (0-9)

- Create an empty string
- Create a list of numbers 0-9
- Create a list of letters A-Z
- Using a loop
    - Assign a random letter between A and Z to the 1st, 4th and 6th position of the blank string.
    - Assign a random number between 0 and 9 to the 2nd, 3rd, 5th and 7th position of the blank string
- Output to the user the Eircode.

In your flowchart make sure you declare any modules and methods you would use in your code.



C)

(i) The Python code below shows code for a coin flipping simulation however, there are eight mistakes in the code that will cause an error to appear when the code is ran. Examine the code carefully and re-write the code error free.

```
1   import random
2
3   results = []
4
5
6   for throws in range(1000)
7     ran num = random.ranint(1,10)
8     if ran_num >= 1 and <= 5:
9       result.append("H")
10  elif ran_num > 5 and ran_num <= 10
11      results.append("T")
12  print("The number of heads thrown was: ", results.count("h"))
13  print("The number of tails thrown was: ", results.count("T")
```

Question 14

A secondary school wants to write a computer program that will decide which of its students can leave the school grounds at lunch time.

(a) The school principal has provided the Computer Science class with the following information to assist with writing the program: There are 700 students in the school, with 120 of these in 6th year. 60% of students are female and 40% are male. Only students in 6th year or with a brother or sister in 6th year can leave the school grounds at lunch time. Lunch break is 1 hour long. Parents must have signed a consent form to say that the student can leave the school grounds.

A) (i) Using the computational thinking skill of abstraction, list two pieces of information, provided by the principal, that are not needed to solve this problem.

1
2

(ii) Name one other computational thinking skill you will use to solve this problem and how you will use it.

Computational thinking skill:
How it will be used:
2

(b) You will need to get data from the school office in order to create the program.

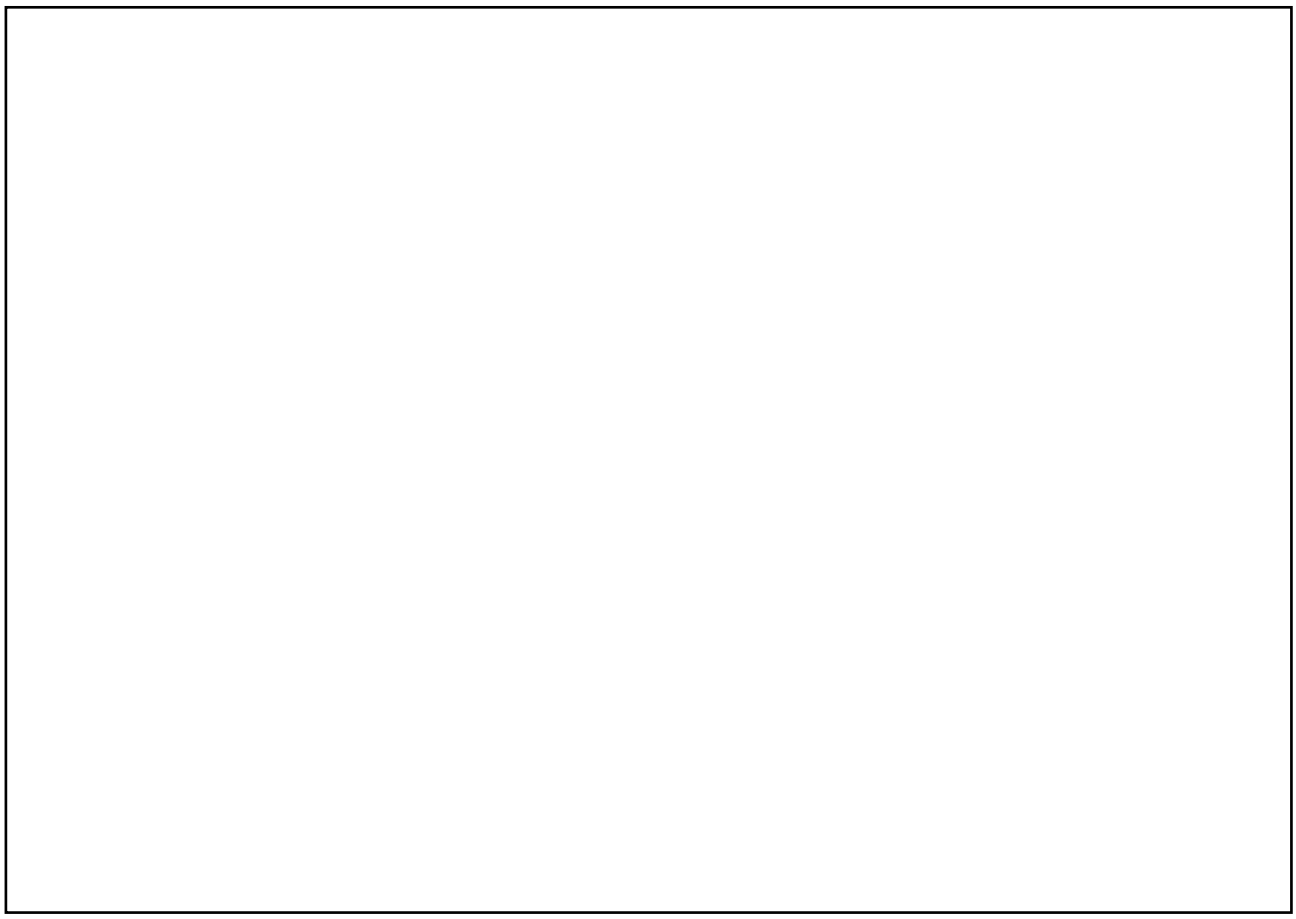
Complete the table below with four items of data that will be required. You will need to include a suitable variable name, a description of the data and the data type for the variable. The first row has been completed for you.

Variable Name	Description	Data Type
`firstName`	Student's first name	String

(ii) When the program is complete you will need to test that it works as expected. Describe two fictional students that you will use as test cases. One should pass the test and be permitted out of the school grounds for lunch; the other should fail the test. For example, the student John Doe in fifth year, with a sister in sixth year but no parental consent will fail the test.

Student 1 (pass)
Student 2 (fail)

(c) Using either pseudocode or a flowchart, design the algorithm to solve the problem for the school principal.



Question 15

A Computer Science teacher has a list of student results in an array called *scores,* as shown below.

45	85	10	90	65	-50

When setting up a bubble sort algorithm for these numbers, the programmer uses a variable called *swaps* which can either be True or False.

A (i) What is the data type of the variable swaps?

(ii) One section of the bubble sort algorithm used by the Computer Science teacher is shown below.

```
if scores[x] > scores[x+1]:
    scores[x] = scores[x+1]
    scores[x+1] = scores [x]
```

However this results in a bug when the code is ran and the teacher gets an output of

```
Sorted array :
[-50, -50, -50, -50, -50, -50, -50, -50]
```

What is the error with the code? Give the corrected version of this piece of code.

Error:
Corrected version:

B (i) The teacher can't solve the problem with the bubble sort so he uses a selection sort instead, what would the array look like after each iteration using a selection sort.

	45	85	10	90	65	-50
Iteration 1						
Iteration 2						
Iteration 3						
Iteration 4						
Iteration 5						

C (i) What is the name of one other sorting algorithm?

(ii) Using either pseudocode or a flowchart, explain how the algorithm you identified in part (i) works. As part of your answer explain the role of each variable you identify in your pseudocode or flowchart.

6th Year Christmas Examination, 2022

Computer Science

Sections A & B

Higher Level

Time: 1 hour, 30 minutes

CANDIDATE DETAILS	
NAME	

SECTION	MARK
A	
B	
C	
TOTAL	